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THE
PHILOSOPHICAL
TRANSACTIONS
(From the Year 1700, *to the Year* 1720)
ABRIDG'D,
AND
Diſpos'd under GENERAL HEADS.

In TWO VOLUMES.

By *HENRY JONES*, M. A. and
Fellow of *King's College* in *CAMBRIDGE.*

VOL. V. Containing
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Part II. The PHILOLOGICAL and MISCELLANEOUS Papers.

The THIRD EDITION Corrected.
In which the *LATIN* PAPERS are now firſt tranſlated into *ENGLISH.*

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THE
Philoſophical Tranſactions
ABRIDG'D.

PART I.

CONTAINING THE
Anatomical and *Medical* PAPERS.

CHAP I.
Zoology, *Anatomy* of ANIMALS.

I. I Remember to have read formerly in one of *Gaſſendus*'s Epiſtles, a Suggeſtion of his (which he ſeems to eſpouſe as his own Opinion) as if he thought it not (originally) natural for Man to feed on Fleſh; though by long Uſage (at leaſt ever ſince the *Flood*) we have been accuſtomed to it, and it is now familiar to us; but rather on Plants, Roots, Fruits, Grain, &c.

On Man's feeding on Fleſh, and of Carnivorous Animals, by Dr J. Wallis, No. 269. *p.* 769.

And I take it to be the Opinion of many Divines, that *before the Flood*, Men did not uſe to feed on Fleſh, becauſe of what we have in *Gen.* ix. 3. where God ſays to *Noah*, (after the Flood) *Every moving* *thing that liveth, ſhall be Meat for you, even as the green Herb have I given you all Things:* Compared with *Gen.* i. 29. where God ſays to *Adam, I have given you every Herb bearing Seed, and every Tree in the which is the Fruit of a Tree, yielding Seed, to you it ſhall be for Meat*; but without any Intimation of his feeding on the *Fleſh of Animals*, which ſeems to be an Inſinuation to that Purpoſe, and is commonly taken ſo to be.

Yet, I confeſs, I have ſome Doubt therein remaining, ſeeing that we find, very clearly, that *Abel* was a *Keeper of Sheep*, as well as *Cain* a *Tiller of the Ground*, both Employments ſeeming equally in order to their Food and Suſtenance. And their firſt *Cloathings* were the *Skins* of Animals. It may perhaps be thought, that theſe Animals were *ſlain* for *Sacrifice*, and the *Sheep* fed only for that Purpoſe, but even their Sacrifices ſeem to have been offered only as a Portion (or Firſt-Fruits) of Things appointed for Food; and that as *Cain* was not to ſacrifice the *whole* Fruit of his *Tillage*, ſo neither was *Abel* the whole Product of his *Sheep*, but the beſt thereof (the Firſtlings of his Flocks, and the Fat thereof) and reſerving the reſt for his own Uſe. And it cannot ſeem likely, that God would give to *Noah* after the Flood, a greater Dominion of other Animals, than had been given to *Adam* in Paradiſe *before the Fall*. And I ſhould then conſider this Permiſſion to *Noah*, not as contra-diſtinct from that to *Adam* (as of what is now permitted, which before were not); but rather as introductive of the *Prohibition* which preſently follows; to wit, Though he might eat Fleſh, even as the green Herb (ſo far as it might be wholſome Food): Yet, *not with the Blood thereof*; that is, not *raw Fleſh*; not *Carnem crudum*, or *Carnem cum cruore*. I add alſo, that the ſame Rule is given to other Animals, *Gen.* i. 30. as is to Man, at *ver.* 29. *I have given them every green Herb for Meat:* Yet there are, we know, many Carnivorous Animals, without any further Permiſſion that we know of.

But (without diſputing it as a Point in Divinity, whether Men before the Flood did, or might feed on Fleſh, ſuppoſing it to be wholſome Nouriſhment) I ſhall conſider it (with *Gaſſendus*) as a Queſtion in Natural Philoſophy, whether it be proper Food for Man.

The Conſideration inſiſted upon by *Gaſſendus*, is from the Structure of the *Teeth*, (and, as I remember this only) that our Teeth are moſtly either *Inciſores*, or *Molitores*; not ſuch as (in Carnivorous Animals) are proper to *tear Fleſh*, except only four, which are called *Canini:* As if Nature had rather furniſhed our Teeth for *cutting* Herbs, Roots, *&c.* and for bruiſing Grain, Nuts, and other hard Fruits, than for *tearing* Fleſh, as Carnivorous Animals do, with their Claws and ſharp Teeth. And, even when we feed on Fleſh, it is not without a preparative *Coction*, by boiling, roaſting, baking, *&c.* And, even ſo, we forbid it to Perſons in a Fever, or other like Diſtempers, as of too hard Digeſtion. And *Children* (before their Palates are vitiated by Cuſtom) are more fond of *Fruits* than of *Fleſh-Meat*. And their breeding *Worms* is wont to be imputed to their *too early* feeding on Fleſh.

This ingenious Conjecture of *Gaſſendus* did preſently ſuggeſt to me another Speculation, which ſeems not leſs conſiderable.

Whether Carnivorous *Animals have a* Colon?

There is in Swine, Sheep, Oxen, and, I think, in moſt Quadrupeds that feed on Herbs or Plants, a long *Colon* with a *Cæcum* at the upper End of it, or ſomewhat equivalent, which conveys the Food, by a long and large Progreſs, from the Stomach downwards, in order to a ſlower Paſſage, and longer Stay in the Inteſtines: But in Dogs of ſeveral Kinds, and I ſuppoſe in Foxes, Wolves, and divers other Animals, which are Carnivorous, ſuch *Colon* is wanting; and, inſtead thereof, a more ſhort and ſlender Gut, and quicker Paſſage through the Inteſtines.

That which I would propoſe hereupon is, Whether it does generally hold, or how far, that Animals, which are not Carnivorous, have ſuch *Colon*, or ſomewhat equivalent; and that thoſe, which are Carnivorous, have it not. For if ſo, it ſeems to be a great Indication, that Nature, which may be reaſonably preſumed to adapt the Inteſtines to the different Sorts of Aliments that are to paſs through them, doth accordingly inform us, to what Animals Fleſh is proper Aliment, and to what it is not; and that from thence we may judge more ſolidly, than from the Structure of the Teeth only, whether or no Fleſh were deſigned as proper Food for Man.

Now it is well known that in *Man*, and, I preſume, in the Ape, Monkey, Baboon, *&c.* ſuch *Colon* is very remarkable; and the like Dr *Tyſon* obſerves in his Diſſection of his *Homo Sylveſtris*, which may therefore be thence conjectured, not to belong naturally to the Carnivorous Tribes, if that Rule hold. 'Tis true, that the *Cæcum* in Man is very ſmall, and ſeems to be of little or no Uſe: But in a *Fœtus*, it is in Proportion much larger than in Perſons adult. And 'tis poſſible, that our cuſtomary Change of Diet, as we grow up, from what originally would be more natural, may occaſion it's ſhrinking into this contracted Poſture.

But I add this alſo, that *Man*'s being endued with *Reaſon*, doth ſupply the want of many Things, which to other Animals may be needful. Man is not covered with ſuch Quantity of Hair or Feathers all over his Body, which to other Animals ſerve for Cloaths; but can, by his Uſe of Reaſon, ſupply himſelf with Cloaths ſuitable to every Climate, and different Seaſons. He is not furniſhed with Claws, Hoofs, Horns, *&c* which ſerve for *Arms* to other Animals; but can, by the Uſe of his Reaſon, ſupply himſelf with Weapons and other Inſtruments for different Occaſions, to much better Advantage. And, in the preſent Caſe, though *raw Fleſh* be not proper, as 'tis to ſome other Animals, he can, by preparative Coctions, and other Expedients, render it more agreeable. Nor is he wholly deſtitute of *Dentes Canini*, but is indeed furniſhed with all Sorts of Teeth, for all Sorts of wholeſome Food.

I take the Sheep, the Goat, the Swine, the Ox, the Horſe, the Aſs, the Camel, the Elephant, the Hart, the Hare, the Rabbet, the Mouſe, *&c.* not to be carnivorous; but the Dog, the Wolf, the Fox, the Cat, the Lion, the Leopard, the Tiger, *&c.* to be naturally carnivorous; which of all theſe have, or have not the *Colon*, or what other diſtinctive Mark may be obſerved between theſe different Tribes of Animals, I think may deſerve a ſerious Conſideration.

On the ſame, by Dr Tyſon, Ibid.

2.] The Argument propoſed by Dr *Wallis*, from the Conformation of the *Inteſtines*, why *Man* ſhould not be *Carnivorous*, ſeems far more rational than that which *Gaſſendus* argues from the Structure of the *Teeth*. I firſt of all make this Remark, That had *Man* been deſigned by Nature not to have been a *Carnivorous Animal*, no doubt there would have been obſerved, in ſome Part of the World, Men which did not at all feed upon Fleſh. But ſince no Hiſtory (as I know of) furniſhes us with ſuch an Inſtance, I cannot but think what hath been done univerſally by the whole *Species*, muſt be *Natural* to them. What the *Pythagoreans* did, in *abſtaining from Fleſh*, was upon the Notion of a μετεμψύχωσις or *Tranſmigration of Souls*, a Miſtake in their Philoſophy, and not a Law of Nature. And though in ſome Countries Men feed more freely on Fleſh, in others more ſparingly, this is owing to their own Choice, from the Advantage they find thereby: Nature having given Mankind *Reaſon*, he can, or ought to elect what Food he finds moſt agreeable to him in the Climate he lives in, and is not determined to any one Sort, but has Liberty to all. And 'tis as probable, that the *Ante-diluvial* World had ſo likewiſe.

We ſhall therefore now conſider it as a Queſtion in *Natural Philoſophy*; Whether, from the Obſervation of the Structure of the Parts in *Man*, we can find Reaſon to think Nature did, or did not, aſſign him to be *Carnivorous?* For I am of *Gaſſendus*'s Opinion, *Liçet ex conformatione Partium Corporis Humani, conjecturas deſumere ad Functiones mere Naturales.* For, all the Knowledge we have of the *Uſes* of the Parts in Animal Bodies, is by obſerving Nature's wonderful Contrivance in the Formation of them; who moſt wiſely adapts them to the *Uſes* they are deſigned for. Not becauſe they are caſually ſo and ſo formed, are they neceſſarily put to ſuch and ſuch Uſes; but therefore they are ſo contrived, that they may perform ſuch Offices in the Oeconomy of Animal Bodies, as Nature intended them for.

Dr *Wallis* having ſo fairly repreſented *Gaſſendus*'s Opinion and Argument from the Structure of the *Teeth*, why *Man* ſhould not be deſigned by Nature to be *Carnivorous*; and having likewiſe ſufficiently, I think, anſwered his Reaſons, I ſhall wholly paſs that over at preſent; and ſhall only conſider the Obſervation he has made of the different Formation of the *Inteſtines* in Carnivorous Animals, from thoſe that are to be met with in ſuch as do not feed upon Fleſh, but other Food. And indeed this ſeems to me to be of far greater Weight, and to carry more Strength in it, than any thing I have met with before; and all the Inſtances he gives are very true.

I therefore firſt of all obſerve, that the *Ductus Alimentalis* (for ſo I call the *Gula*, the *Stomach*, and Inteſtines; all which make but one continued *Canalis* or *Ductus*) is properly the true *Characteriſtick* of an Animal, or *Proprium quarto modo.* For there is no *Animal* but hath ſuch a *Ductus*; and whatſoever hath ſuch a *Ductus*, may properly enough be ranged under the *Claſſis* of *Animals*. *Plants* receive their Nouriſhment by numerous Fibres of their Roots, but have no common *Receptacle* for the digeſting the Food received, or *Vent* for carrying off the Recrements: But in all, even the loweſt Degree of Animal Life, we may obſerve a *Stomach* and *Inteſtines*, even where we cannot perceive the leaſt Formation of any *Organ* of the *Senſes*, unleſs that common one of *Tactus*, as in an *Oyſter*. Where alſo we may obſerve a ſenſible *Muſcular Motion*, or Contraction; though it would be difficult to aſſign what *Part* ſhould be reckoned the *Brain*, or *Medulla Spinalis*, from whence the *Nerves* ariſe that give it ſo ſtrong a Motion.

Now this *Ductus* being ſo principal a *Part* in an Animal, and it's *Uſe* being for the receiving and digeſting the *Food*, and diſtributing the *Chyle*; 'tis reaſonable to ſuppoſe, that, according to the Difference of the Food, the Structure of the *Organ* ſhould be alſo different; or, where the *Organ* was the ſame, there the *Uſe* was the ſame too, for the receiving, digeſting, and diſtributing the ſame Sort of *Food*. Man therefore having theſe Parts formed, not like Carnivorous Animals, but more reſembling thoſe that live on Herbs, Roots, Fruits, &c. it may ſeem reaſonable to conclude, that Nature never deſigned him to live on Fleſh; but, that the Wantonneſs of his Appetite, and a depraved Cuſtom, had inured him to it. For, as *Gaſſendus* remarks in the ſame *Epiſtle*, (*viz. Epiſt. Jo. Bapt. Helmont. operum, Tom.* 6. *pag.* 19.) Cuſtom may make that ſeem natural to us, which Nature never intended. As he inſtances in a *Lamb* that was bred on Ship-board, which refuſed the green Paſture of the Fields for the Diet it was formerly uſed to. And I have often ſeen here in *London* (and it being a Thing ſo unuſual, I take leave to mention it) a *Horſe*, that with a great deal of Pleaſure would eat *Oyſters*, ſcranching them, Shell and all, between his Teeth, and ſwallowing them: And this he took to by Accident, being left at a Tavern-Door, where ſtood a Tub of Oyſters; and ſince hath frequently done it, whenever they were offered him. Now *Gaſſendus* obſerves, That *Children* (from whom he thinks we may better take the *Inſtincts* of Nature, than from our Appetites when depraved by Cuſtom) are much fonder of *Fruit* than of any *Fleſh* that is offered them; and therefore he ſuppoſes it more natural to them.

The *Inſtance* Dr *Wallis* gives, wherein the Structure of the *Inteſtines* of Carnivorous Animals is different from that in Men, is, that the former want a *Colon*; whereas in Men there is a very large one, which is not to be obſerved but in ſuch Animals as live upon Fruits, Roots, Herbs, *&c.* The Point propoſed is to conſider, ***Whether it does generally hold (or how far) that Animals that are not Carnivorous have ſuch a*** Colon, ***(or ſomewhat equivalent) and thoſe that are Carnivorous, have it not.***

Carnivorous *Animals which have no* Colon.

I ſhall begin with thoſe *Animals* that are *Carnivorous*, and have *no Colon*, or large *Cæcum*. For, though they may have the *Appendicula Vermiformis* (as ſome Anatomiſts call it) yet if that is not extended or filled with the *Fæces* which the other Guts contain, I think it not properly to be eſteemed as a diſtinct Gut, or to come into that Number, ſince here it does not perform the Office of a Gut, in containing the Food or Excrement. So in a Man, in Dogs, and other Animals, when it is thus contracted, I exclude it out of the Number of the *Inteſtines*, though by Uſe and Cuſtom (but I ſee no Reaſon for it) 'tis commonly reckoned one of the *Inteſtina craſſa*.

Animals therefore that have no *Colon*, or large *Cæcum*, though ſome of them have this *Appendicula Vermiformis*, and are *Carnivorous*, I reckon,

1. The *Dog-kind*; under which, beſides their own *Species*, may be included the *Fox*, the *Wolf*, the *Coati Mondi*, the *Badger*, the *Otter*, &c.

2. The *Vermin-kind*; as the *Weeſel*, the *Fitchet*, the *Polecat*, the *Martin*, &c. Both theſe Kinds have a Bone in the *Penis*; have no *Colon* or *Cæcum*; ſome have the *Appendicula Vermiformis*; and are all *Carnivorous*.

3. The *Cat-kind*; to which may be reduced, beſides their own *Species*, the *Lion*, the *Tyger*, the *Leopard*, the *Lynx*, the *Catamountain*, &c. 'Tis true, the *French Memoirs for the Hiſtory of Animals*, tell us, That a *Lion* has a *Colon* 18 Inches long, and an *Appendicula Vermiformis* 3 Inches; and that in a *Lioneſs* the *Colon* was two Foot, and the *Cæcum* two Inches long. Now I queſtion whether we may properly call this a *Colon* or no; for though the Gut about this Place may be more extended than in others, yet not having thoſe *Ligaments* whereby the Gut is corrugated into *Cells*, as in a Human Body, I think ſtrictly it does not deſerve that Name. So in a *Cat*, the Inteſtine, at the Place of the *Colon*, is larger; but, for the ſame Reaſon, I ſhall not call it a *Colon*. And though a Cat has a ſmall Projection of the Gut, which may be called a *Cæcum*, becauſe it contains *Fæces*; yet, ſince 'tis ſo very ſhort, we will not inſiſt on it.

4. A *Bear* hath no *Colon* or *Cæcum*.

5. A *Mole*, which feeds on *Worms* and *Inſects*, has no *Colon* or *Cæcum*.

Animals not Carnivorous, *which have a* Colon.

In the next Place we will conſider thoſe *Animals* that are *not Carnivorous*, but live upon Herbs, Fruits, Roots, *&c.* all which have a *Colon*, or *Cæcum*, or both: For, as to the Point in queſtion, I think it much the ſame, whether they have either one of theſe only, or both; provided that the Capacity of the Gut there be large and extended, and do contain *Fæces*. I will enumerate firſt thoſe Animals that have both a *Colon* and a *Cæcum*, or at leaſt a *Colon*. As,

1. The *Horſe-kind*; in which may be included the *Aſs*, the *Mule*, &c. which have a large *Colon* and *Cæcum*.

2. The *Elephant* hath a great *Colon* and *Cæcum*.

3. The *Dromedary* and *Camel*, a long *Colon*.

4. The *Swine-kind*, whoſe *Species* is numerous, have a large *Cæcum* and *Colon*.

5. The *Guiney-Pig*, a *Colon* and *Cæcum*.

6. The *Caſtor* or *Beaver*, has a large *cellulated Colon* and *Cæcum*.

7. The *Hare-kind*, has a large *Colon* or *Cæcum* The *Cæcum* in the *Rabbet* is very long, and in the Middle a *Cochlear Valve*.

8. The *Ape* and *Monkey-kind*, have a *cellulated Colon* and ſhort *Cæcum*.

Now there are ſeveral Animals that have a large *Cæcum*, and no *Colon*, and theſe too are not Carnivorous, but live upon Graſs, Fruits, Roots, &c. as,

1. The *Neat-kind*, as the *Ox*, the *Barbary Cow*, &c.

2. The *Sheep-kind*, which is numerous.

3. The *Stag-kind*, to which may be referred the *Elk*, the *Rane-Deer*, the *Stag of Canada*, &c.

4. The *Goat-kind*.

5. The *Gazella* or *Antelope*.

6. The *Squirrel-kind*.

7. The *Rat-kind*.

By all which Liſts it is plain, there are many Animals that are *Carnivorous*, that have no *Colon* or *Cæcum* at all; and, on the other hand, how vaſt a Number are there that are *not Carnivorous*, that have either a *Colon*, or *Cæcum*, or both?

But notwithſtanding all this, we may be miſtaken in the Concluſion we may be apt to draw from hence; and may as well argue, That becauſe the *Neat-kind*, the *Stag-kind*, the *Goat-kind*, and the *Sheep-kind*, that live on Herbage, have *four Stomachs*; therefore thoſe that have not four Stomachs, were not deſigned by Nature to be *Graminivorous*. Now the *Horſe-kind*, the *Hare-kind*, &c. have but one Stomach, and yet their Food is Graſs. And the Caſe is here the more remarkable, becauſe the *Stomach* is a Part more principally concerned in digeſting the Food. The *Inteſtines* are for ſeparating the *Chyle*, and carrying off the *Fæces*. Yet we obſerve even in Animals that live on the ſame Sort of Food, that their Stomachs are very different. One would therefore be more apt to think, that for digeſting the Variety of Food, and what is of a different Nature, that the *Organ* that is to perform it ſhould be different too. Yet we find the *Stomachs* of Animals that live upon *Fleſh*, of others that live upon *Fruits*, and others that live upon *Graſs*, &c. to be ſo much alike, that 'twould be difficult to aſſign any Difference between them. If therefore we cannot make a Concluſion from the Structure of the *Stomach*, what *Food* is moſt natural to an Animal, much leſs, one would think, from the *Colon* or the *Cæcum*; thoſe Parts of the *Ductus Alimentalis* that are remote from the Stomach; and being ſo, ſeem rather as a *Cloaca*, for the Reception of the *Fæces*, than otherwiſe of any great Concern in digeſting the *Food*, or diſtributing the *Chyle*.

It would be infinite, ſhould I expatiate upon *Nature*'s great *Variety*, in the Formation of the Structure of this *Ductus Alimentalis* in different Animals; and even where we may obſerve much the ſame Sort of Food, yet we do not always find the ſame Structure, though her Intendment be the ſame, in digeſting the Food, diſtributing the *Chyle*, and ejecting the *Fæces* in all of them. But herein ſhe ſhews her great Wiſdom, in attaining the ſame End, different Ways. Had *Chance* any Concern herein, we ſhould not obſerve that conſtant Regularity in the ſame *Species*, nor Variety in different, where the Action is ſo much the ſame.

Since *Man* therefore hath all manner of *Teeth*, fit for Preparation of all Sorts of Food, before it be conveyed to the *Stomach*; I ſhould rather think, that *Nature* did intend he ſhould live upon *all*; or at leaſt is ſo bountiful as not to deny him any, or ſtint him to one Sort only. So in like manner, ſince the *Organ* here in Man is fitly adapted for digeſting all Sorts of Food; I ſhould rather incline to conclude, that therefore *Nature* intended all Sorts for him: Which *God Almighty* aſſures us he did, *Gen.* ix. *ver.* 3. *Every moving thing that liveth ſhall be Meat for you, even as the green Herb have I given you all things.*

But perhaps it may be expected I ſhould give you ſome Inſtances in *Brutes*, where it doth not hold, that all *Carnivorous* Animals have no *Colon* or *Cæcum*, though as to Man the Caſe may be different. Now the *Carigueya* or *Opoſſum* (whoſe *Anatomy* I have given in *Philoſoph. Tranſ.* N° 239. *) had a long *Colon*, though not *cellulated*, and a large *Cæcum*, that received all the *Fæces* as they paſſed down: Yet this Animal feeds on *Poultry* and *Birds*. And I have a Male *Opoſſum* now by me, that feeds on nothing but *Fleſh*. On the other hand, the *Hedge-Hog* or *Urchin*, that hath no *Colon* or *Cæcum*, and therefore by this Rule ſhould be *Carnivorous*, feeds on *Roots*, *Fruits*, *Herbs*, &c. and not on *Fleſh*. *Hogs* likewiſe, that have both a *Colon* and *Cæcum*, will feed upon *Fleſh* greedily enough, when they can meet with it, though their ordinary Food be of another Kind. And a *Rat* or *Mouſe*, that have a large *Cæcum*, but no *Colon*, feed upon *Bacon*, as well as *Bread* and *Cheeſe*. But if what *Ælian* tells us (*Hiſt. de Animal. lib.* 17. *cap.* 45.) can be relied upon, there is an Inſtance in the *Neat-kind* alſo: For he aſſures us, Ἀγριώτατοι δὲ ἄρα ἦσαν τῶν ζώων οἱ τῶν Αἰθιόπων ταῦροι, ϗ καλούμενοι σαρκοφάγοι. So likewiſe in the ſame Book, *cap.* 25. he mentions *Horſes* and *Sheep* that feed upon *Fiſh*. But theſe Stories, I ſuppoſe, he hath taken up from the *Indian Hiſtorians*; whoſe Credit I have ſufficiently examined in my *Diſcourſe concerning the Pigmies of the Ancients*; and

* Vid. ſupr. V. ii. C. VI. S. CIX.

and ſhall therefore lay no Streſs upon them. Dr *Wallis*'s Obſervation therefore as to *Brutes*, tho' it may hold for the moſt part true, yet it is not univerſal; and, as all other Rules, may have ſome Exception.

On the ſame, by Dr Wallis, Ibid.

3.] Dr *Tyſon*, I think, is much of the ſame Opinion with me. I am inclined to believe, that all Nations (as well before as ſince the Deluge) have uſed to *feed* on *Fleſh*. Which is a ſtrong Preſumption (as is well obſerved) that to feed on Fleſh *(duly prepared)* is not wholly *unnatural* to Mankind. On the other hand, I believe Dr *Tyſon* thinks (as I do) that *raw Fleſh* is not *natural Food* for our Bodies. I do not know that any Nation have, of Choice, uſed to feed on *raw Fleſh*, unleſs in Caſes of *Extremity*, or when they have not the Convenience of *Preparing* it by previous *Coction*, or ſomewhat equivalent. For I put a great Difference between *raw Fleſh* (which is the common Food of what we call *Carnivorous Animals*) and Fleſh *duly prepared* for our Food. If any there be that (of Choice) feed on *raw Fleſh*, I look upon it as a Caſe *Anomalous*; like that of the *Lamb* mentioned by *Gaſſendus*; and the *Horſe* (Dr *Tyſon* mentions) that *eats Oyſters*. I may add, the *Rat* eating *Bacon*, for want of other Food, (which yet is not quite void of Coction; and the *Swine* ſometimes eating *Poultry*. Which latter I do not take to be purely *Natural*, but rather the Effect of an *Appetite depraved* by Cuſtom; becauſe much of the *Hog-waſh* we give to *Swine*, ariſeth from the Coction of *Fleſh* for our own Uſe; which doth inure the Swine (a voracious Animal) to the *Taſte of Fleſh*, and makes it familiar to them. But Fleſh, *duly prepared for our Food*, I look upon as a thing very different from *raw Fleſh*, and which may be proper Food for Man; if (and ſo far as) it agrees with our *Health*: Which Caution is to be obſerved, as to other Food, as well as Fleſh. And this I refer to the Care of the *Phyſician* and the *Apothecary*, rather than the *Cook* and the *Confectioner*: For theſe do oft comply with the *Wantonneſs* of the *Palate*, rather than the *Health* of the Body.

I leave it to be conſidered, from what *Reaſon*, and for what *Uſe* the Paſſage of *Fleſh* through the *Ductus Alimentalis*, ſhould (ordinarily) be more *Quick*, and that of *Herbs* more *Slow*; (for that ſeems to be the Cauſe, the *Colon* making the Way *Longer*, and the Paſſage *Slower*;) and, in what Degree it is ſo. I ſay *Ordinarily*; becauſe, in caſe of *Cathearticks* (or what is equivalent) the Speed is quickened.

And, again; When as Nature ſeems to have (originally) deſigned, in Man, a large *Cæcum*, as in ſome other Animals (and which, if I miſtake not, is, in the *Fœtus*, larger, in Proportion to the reſt of the Inteſtines, than in Perſons Adult,) How it comes to paſs that it is now of little or no Uſe, but ſhrinks up into an *Appendicula Vermiformis*; Whether or no this may partly proceed from our Feeding ſo much on *Fleſh*, which will not admit ſo great a *Remora*, as a large *Cæcum* may occaſion in other Animals.

Inſects in Spain; *by Dr* J. P. Breynius. n. 301. *p.* 2050.

II. Out of an immenſe Number of *Locuſts*, *Butterflies*, *Moths*, *Libellæ*, *and Snails*, &c. which I have obſerved in *Spain*, I ſhall pick only a few.

An uncommon Graſs Hopper. Fig. 1.

Figure 1. repreſents a *Locuſt*, which I don't know if Authors have deſcribed or not, but it appeared to me to be very ſingular. It was of a very beautiful green Colour, and of the ſame Size with the Figure. It moved ſlowly, having no Wings, but inſtead of them upon the Back, immediately below the Shoulders, two very ſmall, roundiſh, clay-coloured Membranes. It's Head was adorned with very long Antennæ, green and jointed. I ſaw only one of theſe Inſects, ſitting upon an Oleander.

Bruchus. Aldrovand. Fig. 2.

Figure 2. repreſents an Inſect, which is deſcribed and painted by *Aldrovandus*, in his Hiſtory of Inſects, L. 4. T. 5. Fig. 2. and 3. under the Name of *Bruchus*, of an uncommon Figure; but his Deſcription is lame, and the Figure by no Means accurate. The Head of this one I ſaw was oblong, creſted above, and had two very ſhort Antennæ before. The Body and Legs were very ſlender, the Tail broadiſh, articulated, curled in, and notched round it's Edges, with a Ridge of the ſame Kind along it's Middle. When it reſted, the the Body was ſupported upon two fore Legs folded, and it uſed them too in walking; but they ſeemed to me to be principally deſigned by Way of a Pair of Forceps to lay hold of it's Food. It's Colour was ſomething between that of Aſhes and Clay, with blackiſh-brown Spots ſcattered here and there. I found only one of them amongſt the Graſs, which I kept alive ten Days without any Food, and at laſt killed it with a Needle. To this Species is likewiſe to be referred that repreſented by *Aldrovandus*, L. 4. T. 3. Fig. 9.

Mantes. Mouſet *and* Johnſtone. Fig. 3.

Figure 3. ſhews an Inſect, which *Mouſet* and *Johnſtone* deſcribe and delineate by the Name of *Mantes*. To which Species, in my own Opinion, belong thoſe delineated by *Aldrovandus*, l. c. T. 1. F. 1. and 2. and T. 3. Fig. 10. and by *Johnſtone* T. 13. F. 18, 21, 22. and beſides all the walking Leaves, as they are called, brought from the *Indies*, which are by no Means the Leaves of Vegetables transformed into theſe Inſects, as ſome have fooliſhly imagined, but Inſects produced in the common natural Way, as will eaſily appear to any-body who conſiders the Thing accurately, and does not give a ready Ear to Prodigies, and fabulous Stories. This Inſect then was exactly of the ſame Size as expreſſed in the Figure. It had four Wings, the two uppermoſt, which were full of Veins or Strings, had the Reſemblance of dry Leaves (which is ſtill more remarkable in thoſe which come from the *Indies*, whence the Fable of their being produced from the Leaves of Plants aroſe) of a browniſh yellow Colour; the lower ones were larger than the others, but more fine, yellowiſh, with black Spots, and not ſo full of Veins: So that the upper ones ſupply the Place of Sheaths for the others, as you may obſerve in Beetles. Farther, the Extremity of the Belly was bifurcated, the fore Legs thicker, and jagged, as in the preceding Inſect, and likewiſe deſigned by

Nature for the ſame Purpoſe. The reſt of the Body was of a browniſh clay Colour.

Happening once to ſhew the Figures of the two laſt Inſects to the famous *Valliſnerius*, out of the great Affection and Benevolence which he has always been ready to ſhew me, he was pleaſed to communicate to me the following Remarks taken out of his Collection of Obſervations; *viz.* that he had found them himſelf in *Italy* in the Hills of *Scandia*, *Reggio*, and *Coneglio*, and had them ſent to him likewiſe by his Friends from *Marca Ancona*, *Maurata*, *Legborn*, and *Florence*; and at laſt he bred them up in his Garden. That they were both of the ſame Species, only of different Sexes, *viz.* the Male is the one without Wings, Fig. 2. and the Female with Wings, as repreſented in Fig. 3. That by the *Spaniards* this Inſect is called *Salta Monte*; by thoſe of *Legborn*, *Cavallo Verde*; by his Friend D. *Ceſton*. *Grillo-Centaurus*; and by himſelf, the *Spider-Locuſt*. That he had ſeen ſome of them half as large again as mine, and the Female very frequently of a greeniſh Colour; whence the *Italians* call it *Cavallo Verde*. That beſides they were Carnivorous, and it was a pretty Sight enough to obſerve them hunt their Prey, as *Flies*, *Crickets*, and *ſmall Locuſts*, which they catch with their fore Legs, raiſing their Body up, and frequently devour; which ſhews them not a little fierce and tyrannical. Further, that the Female builds her Neſt in the Space of one Night (*viz.* eight Hours) doing the whole with her Tail lifted up, the reſt of her Body remaining unmoved. That it is two Years before the Female is fit for Generation, and then the firſt Neſt ſhe makes is about the Size of a Filbeard; the next Year it is larger, and the next after that of the Bigneſs of two Filbeards. That the Time of building their Neſts is Autumn, and the *May* or *June* thereafter the young Ones come out, of the ſame Figure with their Parents, but extremely ſmall, for the moſt Part to the Number of an Hundred, and ſometimes of two Hundred, according to the Largeneſs of the Neſt, and the Age of the Mother.

Fig. 4.

Figure 4. repreſents the Figure of the *Neſt*, taken from that which was given me by *Valliſnerius*. It is of a muddy Aſh-Colour, and ſeems compoſed of a thick Humour from the Podex of the Female, which afterwards becomes hardened. Amongſt the Peaſants it is commonly called *Cicala ſecca* (or the dry Graſhopper) for they take it to be a dead Graſhopper dried.

A Gally-worm.
Fig. 5, 6.

Figures 5, and 6. repreſent a *Gally-Worm*, very frequent in the Earth, under the Leaves of Plants. It is of a white Colour, varied with black Rings, and Spots of the ſame Colour between each Ring. It's Head is black, as alſo it's Feet.

Small Marine *Animals.*

This is all I ſhall ſay of thoſe Inſects which I have obſerved in Spain; to which however, on Account of the Affinity of the Subject, I ſhall add three ſmall Sea-Animals, which were found in the Month of *Auguſt*, by a Sailor who was ſwimming when the Sea was calm, *A Sea-Blubber.* Fig. 7. not far from the Iſland of *Yvica* in the *Mediterranean*, and brought to me to examine. The firſt is a Kind of *Sea-Nettle*, as it is called by Authors, the upper Part of which is repreſented in Fig. 7. It's Skirts, which were ſomewhat hollow, were of a beautiful blue Colour, and it's Middle, which was rather convex, was very finely ſtriped with circular and radial Streaks of the Colour of Silver. On it's upper Part there were eminent radiant Appendages, which it moved pretty quick like Oars upwards and downwards, of a faint blue Colour, and almoſt diaphanous, to the Extremities of which were attached, by very ſmall Peduncles, little globular Bodies of a blackiſh blue Colour. Theſe Appendages were very eaſily rubbed off, and thereby the whole Animal, being very ſoft and mucous, eaſily deſtroyed.

Fig. 8. Figure 8. ſhews it's upper Part, which, beſides the Appendages already deſcribed, was adorned with Filaments of two different Kinds. The firſt Kind, which ſurrounded the Skirt, was compoſed of ſhort round Filaments, of a pale blue Colour, and ſmooth; the other, which occupied the Middle, had them likewiſe very ſhort, but with a Kind of Orifice at their Extremities, and of a white Colour. By theſe, without Doubt, the little Animal adheres to other Bodies, and takes in it's Food.

Fig. 9. Figure 9. ſhews one of it's Appendages, as it appears by a Microſcope. All the other Figures are of the natural Magnitude of the Animal.

A Kind of Sea-Leech. Fig. 10. The ſecond Species of Sea-Animals I ſaw, was a ſurpriſing Kind of *Sea-Leech*, pretty enough to look at. Figure 10. repreſents it's Back ſomewhat flat, elegantly painted with a longitudinal ſilver-coloured Streak in the Middle, with Lines ſomewhat blueiſh going out from it laterally. It's Fins too were of the ſame Colour mixed with Silver, and it moved them very quick in ſwimming. It's Sides were of a pale Blue, and it's Belly was white. It had a ſmall oblong Head, with two Eyes, and a little double Beard. It's Mouth, with which it faſtens itſelf to different Bodies, in order to ſuck them, as I imagine, was very ſmall and round. On the left Side there was a very ſmall Orifice, which I took to be the Anus. I ſaw two or three of theſe, which, being put into a Glaſs full of Water, died in a few Hours; and upon trying to preſerve them in Spirits of Wine, they preſently contracted very much, and their blue Colour was changed into a dirty ruſty Colour.

A Sea-Snail. Fig. 11, 12, 13. The laſt of all was the *Snail*, (Fig. 11, 12, 13.) the Shell of which was more beautiful and ſingular in it's Colour, than it's Figure; for it was painted of a deep Blue, inclining, though but very little, to a roſe Colour. It was extremely thin, very ſmooth and ſlippery, containing within it a little Animal repreſented Fig. 11. which ſpewed out a Liquor of the ſame Colour with the Shell, and there adhered to it a Kind of viſcid Spume, by Means of which it ſwam upon the Surface of the Water. This ſame *Sea-Snail Shell* is ſo rare, upon Account of it's Colour, that I don't remember ever to have ſeen it either deſcribed, or in the Collections of *Virtuoſi.* And the Reverend and Learned Father *Bonanni*, in his Book called *Recreatione dell' Occhio, The Recreation of the Eyes, Par.* 3. *Probl.* 35. concludes from the ſame Argument, that there are not, nor cannot be, any ſuch in Nature, for Reaſons which he brings in there, and which you may ſee at full Length in the Place above-cited.

Beſides theſe Sea-Animals all of a blue Colour, there appeared a great many other very beautiful little Animals called *Sea-Sails*, of a blue Colour like the others, which, although they well deſerve to be accurately examined, I ſhall nevertheleſs here paſs over in Silence.

Inſects in the Barks of Elms and Aſhes, by Sir Matth. Dudley. *n.* 296. *p.* 1859.

III. About five or ſix Years ſince, I removed divers Elms, more than ſix Inches Diameter, which for the firſt two or three Years all thrived very well; but two or three Years ago there happening a very dry Time in *July* or *Auguſt*, I obſerved one of thoſe Elms, which ſtood very ſhallow, and on pretty high Ground, looking very ſick; the Leaves turned yellow, and began to fall off, which made me with a Knife examine the Bark. I found the Inſide thereof not ſo green, but of a more reddiſh Colour than the others; and between it and the Tree not ſo moiſt, and the Bark ſticking very cloſe to the Wood: But what was moſt remarkable, I diſcerned a great many little black Flies of the Beetle Kind, (*viz.* having a hard Caſe, under which their thin long Wings were contracted, and therewith covered) between the Bark and the Tree: And looking more carefully, I obſerved theſe Flies had made their Way thither, by piercing the Bark in innumerable Places, eaſily diſcernable on the Out-ſide, and was about the Bigneſs of a large Pin-hole, or rather ſuch as a large Pin's-head would go into; ſome I found juſt entring, who had not got quite thro' the Bark, others had made ſome Progreſs between the Tree and the Bark, which appeared as a Channel. I deſpaired of recovering the Tree; however, my Servants being watering others, I cauſed them to beſtow about two Hogſheads on this Tree, with ſtirring the Earth about the Roots, and laying ſome half-rotten Litter thereon, to defend it from the ſcorching Rays of the Sun: Upon this the Tree in ſome manner recovered it's Verdure again that Year, and the next Year made very good Shoots, and ſo continued until this Year.

But this being a very dry Summer, I diſcerned divers of my Trees in the Beginning of *Auguſt* to look ſick, and particularly the Tree formerly mentioned; I made the ſame Tryal on them all, and found the Bark ſticking cloſe to the Tree, with but little Moiſture between, and vaſt Numbers of thoſe little Flies, who had pierced the Bark in Multitudes of Places. I ordered the Earth about the Roots to be looſened as formerly, and about two Hogſheads of Water to be poured on each; and viewing them the next Morning, I found the Outſide of the Tree almoſt covered with Bees and Waſps, and great black Flies, ſuch as they uſually call Fleſh-Flies, who were all buſy in ſucking the Juice or Sap, which plentifully run out at every Hole, that the little Flies formerly mentioned had made in the Bark, and which was very glutinous, and ſweet as Honey. I again examined the Bark, and found it very moiſt between it and the Wood, and all thoſe little Flies either gone, or drowned in their new Habitation, by the ſudden Riſe of the Sap: This Tree recovered.

Upon Examination of ſeveral Trees, which looked ſicker than the reſt, I found almoſt all Greenneſs had left the Bark, and there remained no Moiſture between it and the Wood; but the Bark ſtuck ſo cloſe to the Wood it was hardly to be parted: And throughout the whole Tree the Bark was pierced by the aforementioned little Flies, who, from the Hole at which they entred, had made each of them a ſtrait perpendicular Channel from their Entrance upwards, about two Inches long, or ſomething more, very little, if at all, bigger than juſt to move themſelves ſtrait forwards in; for I obſerved they all of them, if diſturbed, came out backwards. All along on each Side this Channel, as cloſe the one to the other as they well could, ſo as yet to be diſtinct, there were ſmall Channels running horizontally from it, in every one of which, at the Extremity thereof, there was a Maggot, in Size juſt the Bigneſs of the ſmall Channel, very lively, whitiſh, and almoſt tranſparent. Theſe Trees, though well watered, received no Benefit thereby, but died.

It is to be obſerved, That in thoſe Trees, whoſe Leaves looked green and healthful, there was none of theſe Flies to be found.

The Reaſon of which I preſume to be, That whilſt there was a ſufficient Moiſture in the Earth about the Roots to ſupply the Tree with a due Quantity of Sap, ſo thin and diluted, that it was proper and capable of being conveyed into the ſmalleſt Twigs and Leaf Veſſels, the Leaves kept their Verdure, and the Tree flouriſhed: But when, by reaſon of the dry Seaſon, that Supply failed, and the Sun perpetually exhaling the thinneſt and more watry Parts thereof through the Bark, the Sap already in the Tree became inſufficient in Quantity, as well as improper, by reaſon of it's Thickneſs, to ſupply or enter into all thoſe ſmall Veſſels. The Leaves loſt their Greenneſs, and fell off, and the Sap became thick and very ſweet (which I have found it is not, when it is duly diluted, and the Tree in good Health); this invited thoſe Flies to make their Way to it, as a proper Nurſery to bring up their young Ones, which I take thoſe little Maggots to be. I preſume alſo, that the Eggs were firſt laid in the great Channel (and it may be, regularly placed at their due Diſtances, in the Sides thereof) and after being hatched, made thoſe ſmall Channels themſelves; ſince thoſe ſmall Channels are no way capable of receiving the old Fly, and that the Maggot was always found at the farther End of the little Channel, and the reſt of the little Channel is perfectly filled with very ſmall Particles, which, when dry, became fine Duſt; and I conceive to be either the Excrements of the Worm, or Parts of the Bark ground ſmall by the Teeth of the Worm, to make it's Way forwards, and rejected as not proper Aliment, or both.

About the Middle of *October* I found thoſe little white Maggots, and conſequently their Channels, which they exactly filled, were grown much bigger, and had made their Progreſs from the Place where they were firſt hatched, which was cloſe to, or upon, the very Wood of the Tree, almoſt to the very Outſide of the Bark of the Elm, which is uſually pretty thick; and in every one of thoſe perpendicular Channels before-mentioned, I found the Mother-Fly lying dead, for the moſt Part towards the Entrance of the Channel.

Theſe Obſervations put me upon viewing the Wood which lay in my Yard for Timber or Fewel, and in all the Elm which was felled laſt Spring, I found the Bark thereof as much pierced; the ſame Mother-Channel, which for Diſtinction ſake I beg leave ſtill, tho' improperly, to call Perpendicular (for theſe Trees lay on the Ground) and the ſame little (now as improperly called horizontal) Channel proceeding from the Mother-Channels full of Maggots, which Maggots had alſo made their Way, almoſt to the Outſide of the Bark.

Obſerving ſome Elm which had lain much longer in the Yard, and taking off the Bark, I found the ſame Tracks both of Mother-Fly and Maggots; and that at the Extremities of almoſt all the horizontal Channels made by the Maggots, where they had ſubſiſted long enough to come to any Perfection, the Bark was pierced quite through, by a Hole juſt the Bigneſs of the Channel, and nothing left remaining, but a Sort of a whitiſh pretty tough Skin, exactly the Colour and Size of the Maggot, and the Mouth of the Hole, and the reſt of the forſaken Channel perfectly filled with what I formerly preſumed to call the Excrement of the Maggot.

Then I examined the Aſh-Wood, which had lain ſome time in the Yard, and at firſt Sight, it being young, and it's Bark pretty ſmooth, I perceived it full of ſmall Holes; and on ſeparating it from the Tree, I found juſt the ſame Sort of Work as in the Elm, and by the ſame Sort of Fly, having found ſeveral of the Mother-Flies dead in their Channels, and the ſame empty Skins at the Extremities of the other Channels; only with this Difference, that whereas in the Elm all the Mother-Channels were perpendicular, and the Maggot-Channels horizontal, here in the Aſh it was juſt contrary, all the Mother-Channels were horizontal, and the Maggot-Channels perpendicular; this I at firſt thought might be accidental, and peculiar to that Piece of Wood, but on Examination of above 100 Pieces of Wood of different Trees, and felled at different Times, I found it exactly to hold true in them all.

I obſerved ſeveral Oak and Maple Trees, which had been felled, ſome in Winter, and ſome in Summer, and the Bark remaining thereon, but could find no ſuch thing in either of them.

Fig. 14, 15, 16, 17, 18, 19, 20, 21, 22.

Fig. 14. *Shews the Bark of Aſh.* Fig. 15. *The Bark of Elm.* Fig. 16. *The Worm as big as the Life, lying on it's Back.* Fig. 17. *The Mother-Fly with it's Belly upwards, as big as the Life.* Fig. 18. *and* 19. *The Worm and the Fly with their Backs upward.* Fig. 20. *and* 22. *The Worm magnify'd.* Fig. 21. *The Mother-Fly magnify'd.*

Worms *in the Heads of* Sheep, *by Mr* J. Thorpe, n. 295. *p.* 1800.

IV. I here ſend you the Delineation of a Worm, found in diſſecting the Head of a Sheep, in the Cells formed between the *Laminæ* of the *Os Frontis:* It is an *Apode*, and ſeems to be a Species of the *Eulæ*; tho' much different from the common Sort breeding in putrid Fleſh. It is every-where of a pale fair Colour, excepting it's Tail, which ends a little obliquely in a Plane; on which are impreſſed two remarkable black Spots. (as in *Fig.* 23.) Fig. 23. Beſides two ſmall white *Corniculæ*, it's Head is armed with a Pair of black, ſharp, and crooked *Forcipes*, which in contracting and extending it's Body, it draws in, and puts out at Pleaſure: With theſe it is, that in creeping it takes hold of the Surface of the Body on which it moves; and draws itſelf forward on pretty large, protuberant, and ſomewhat flattiſh *Toruli*, fewer in Number than thoſe on it's Back *(vid. Fig. 24.)* Fig. 24. which alternately ſwelled and relaxed, ſeem inſtrumental to it's Motion, and ſupply the Place of Feet. It looks of a clear, cryſtalline Subſtance, and almoſt tranſparent.

The Membrane that inveſted the Cavity of the Cells containing it, was very fat, and in moſt Places ſeparated from the Bone; the Blood-Veſſels appeared turgid and inflamed; whereas the Membrane of the oppoſite Cells, which have no Communication with theſe, was thin, pellucid, adherent, and no-way preternaturally affected.

I have given the more particular Deſcription of this Worm, and the Cells it was found in, it not being deſcribed by any Author I have yet conſulted. Mr *Bobart* informs me, “That ſome curious Gentlemen of the Univerſity, lately obſerved three Worms lodged in the ſame Parts of the Head of a Sheep, but in two diſtinct Cells: The largeſt apart by itſelf, the other two in the Cell adjoining; one of which was conſiderably leſs than the other, agreeing in Form with the fore-mentioned, of a whitiſh Colour in general, with two notable Spots on the flat of the poſterior Part, but a Shadow of Brownneſs from the Back down the Sides (eſpecially of the riper one); roundly turgid on the Back, and flat underneath; divided with ſeveral *Annuli*, as theſe Creatures generally are; at the Extremity of which Protuberances, ſerving inſtead of Feet, there appears a little darkiſh brown Spot on each Side or Edge: As they faded and withered, they changed to a light Red, or Phœnicious Colour, and afterwards brown.”

(a) *Moufet* mentions Worms yearly breeding in the Brain of Stags, Goats and Sheep (eſpecially when fat) but ſuppoſing them generally known, gives no Deſcription of them; unleſs from (b) *Benedictus* and (c) *Mathiolus*, that they are *Eulis maximis æquales, & ejuſdem cum illis formæ:* Tho' the Worms meant by thoſe two Authors are not found in the Brain, but (as they both agree) *ſub lingua in concavo circiter vertebram, qua cervici innectitur caput.* (d) *Avicenna* aſſerting the poſſibility of Worms breeding in the Head, ſays expreſsly, *Multoties naſcuntur in anteriore parte capitis ſuper locum qui eſt in ſtrictura narium:* To which (e) *Joubertus* adds, *Ubi oves, & capræ dicuntur perpetuò vermes habere, ut cervi in gutture.* This plainly ſhews the diſtinct Places of their generating in the Heads of Stags and Sheep, as well as deſcribes the particular Cells, in which they are found in the *Os frontis* in the latter.

Trallian (f) relates a memorable Story from *Moſchion*: *Democrates* the *Athenian* applying himſelf to the Oracle at *Delphos* for the Epilepſy, received the following Anſwer;

> Μείζον' ἀειράμενος κεφαλῆς ποιμνήιον εὐλὴν
> Μηκάδος ἀγρονόμοιο, δέρας περικάμβαλε μήλου
> Ἕρπυλα πολύπλεκτον εὐρίνου ἀπὸ κόρσης.

Which *Guinterius Andernacus* renders thus;

> *De grege ſume capræ majores ruris alumnæ,*
> *Ex cerebro vermes, & ovis dato tergora circum*
> *Multiplici vermi pecoris de fronte revulſo.*

Democrates not comprehending the hidden Meaning of the Oracle, referred it to *Theognoſtes Democratius*; who, recollecting that the Head of a Goat near the *Baſis* of the Brain is naturally impregnated with Worms, right ſagely unfolded the Myſtery; adviſing him, in purſuance to *Apollo*'s Directions, to procure one or three of them (for, it ſeems, it muſt be an odd Number) by provoking the Animal to ſneeze; and wear them about his Neck, in the Skin of a black Sheep, as an Amulet.

'Tis not to be imagined, how Worms ſeated at the *Baſis* of the Brain, where *Trallian* places them, ſhould be expelled by Sternutatories. The Words of the Oracle [Εὐρίνου ἀπὸ κόρσης] admit of a more favourable Conſtruction, and diſtinctly expreſs the Cavity over the Noſe; from whence, by a Paſſage that opens into the Palate and Noſtrils, they may eaſily be diſcharged by ſneezing. By the ſame Paſſage they may as eaſily inſinuate themſelves, when ſmall; or rather be drawn up with the Breath in the State of Eggs, and depoſited in thoſe Cells: Where animated by the vital Heat, and nouriſhed by preying on the Membrane in which they are included, they may more probably occaſion the Epilepſy in Sheep and Goats (a Diſtemper (g) *Hippocrates* obſerves to be frequently incident to them, tho' he aſcribes it to a different Cauſe) than cure it in Men.

(a) *Theatr. Inſect. lib.* 2. *cap.* 30. (b) *Lib.* 21. *in proœm.* (c) *Comment. in Dioſcor. lib.* 2. *cap.* 52. (d) *Lib.* 3. *ſen.* 1. *cap.* 3. *tract.* 2. *cap.* 3. (e) *Cap.* 9. *de Cephalalgia.* (f) *De Arte Med. lib.* 1. *cap.* 15.

From hence perhaps we may be allowed to account for thoſe various Inſtances given by Medicinal Authors, of Worms ejected at the Noſe by Men and Women. (h) *Benivenius*, (i) *Fernelius*, (k) *Zacutus Luſitanus*, (l) *Ronſſeus*, (m) *Trincavellius*, (n) *Hildanus*, (o) *Baptiſta Codronchus*, (p) *Tulpius*, (q) *Verzaſcha*, and (r) others, relate ſeveral Caſes of this Kind; all agreeing that they were attended with extream Pains in the Head, *Mania*'s, *Lypothimies*, &c. which immediately ceaſed at their Ejection.

It muſt be granted, (s) *Ægineta*, (t) *Gabucinus*, (u) *Foreſtus*, (w) *Borellus*, and particularly (x) *Fulvius Angelinus*, who wrote an entire Diſcourſe *De Verme admirando per Nares egreſſo*, very rationally conclude, the Worms they treated of came from the Stomach, or Lungs, they not being attended with thoſe Symptoms, nor affecting the Head; as in the Caſes related by the Authors we have mentioned; particularly in that remarkable Inſtance in (y) *Hollerius* of a Worm evacuated at the Noſe, *nullâ tuſſi, nullo vomitu antecedente*: Which, by the acute Pain it produced, plainly diſcovered where it lay concealed.

Whether Worms may generate in the Brain, or it's Teguments, I ſhall not determine: 'Tis ſufficient (ſuppoſing it poſſible) that there is no Paſſage for them thence to the Noſe; where they are often found, as we are aſſured by many credible Writers. *Angelinus* and *Alſarius à Cruce* place them *prope naſi colatoria in ſtricturâ narium*; both ſeeming to imply that *Sinus* more exactly deſcribed by (z) *Avicenna*: Which is to be underſtood of human Heads, not thoſe of Brutes, but only as applied by *Joubertus*.

What terrible Symptoms, as *Cephalaa's*, *Deliriums*, *Epilepſies*, *Syncopes*, *Convulſions*, &c. a Worm, with ſuch ſharp and piercing Weapons may raiſe, by continually preying and ſporting on a Part ſo exquiſitely ſenſible, and nearly ſituate to the Origin of Senſation, as the Membrane that inveſts the Cavity of this *Sinus*, may be more eaſily imagined than explained.

(g) *De Morbo Sacro.*

(h) *De abditis Morb. cauſis, cap.* 100.

(i) *De Part. Morb. & Sympt. lib.* 5. *cap.* 7.

(k) *Prax. Med. admir. lib.* 1. *obſ.* 7.

(l) *Miſcell. Epiſ. Medicinal.* 10.

(m) *De ratione curand. partic. hum. corp. affect. lib.* 9. *cap.* 11.

(n) *Obſervat. cent.* 1. *obſ.* 8.

(o) *Epiſ. ad Fulv. Angelinum & Alſarium crucium: vid. Crucium de Quæſitis per Epiſ. cent.* 3.

(p) *Obſervat. Med. lib.* 4. *cap.* 11.

(q) *Obſervat. Med. Obſ.* 6.

(r) *Tho. Bartholin. Hiſt. Anatomic. cent.* 1. *Hiſt.* 64. *Epiſ. Med. cent.* 2. *Epiſ.* 74, & 85. *Ephem. German. Ann.* 2. *Obſ.* 147. *Ann.* 4. *Obſ.* 37.

(s) *De Re med. lib.* 4. *cap.* 57.

(t) *De Lumbric. cap.* 8.

(u) *Obſervat. medicinal. lib.* 21. *Obſ.* 28.

(w) *Hiſt. & Obſervat. medic. cent.* 2. *Obſ.* 70.

(x) *Apud Alſar. Crucium de Quæſit. per Epiſ. cent.* 3.

(y) *De Morb. intern. lib.* 1. *cap.* 54. *in Schol.*

(z) *Loc. ſupra citat.*

V. Theſe Experiments were made in *Chelſea-Park*, in the Months of *May*, *June* and *July* 1719.

Obſervations on Silk-Worms, *and their* Silk, *by Mr* H. Barham, n. 362. *p.* 1036.

April 27. I received a ſmall Parcel of *Silk-Worms* Eggs from *Languedoc*.

May 6. Early in the Morning I found them hatched of themſelves, the Wind ſhifting in the Night from *Eaſt Northerly*, to the *Weſt Southerly*, changing the Air of a ſudden to warm, two Days before the Change of the Moon.

After feeding and managing them according to Art, through the whole Courſe of their four Sickneſſes, they were come to their State of Perfection, being then as thick as a Man's little Finger, and from four to five Inches long, of a yellowiſh Colour, and when held againſt the Light, they might be ſeen through, as you may an Egg, being of the ſame Colour and Conſiſtence (filled with the Matter that makes the Silk). This is a certain Sign that they will begin to ſpin in 24 Hours, or leſs. They then forſake their Food (being very voracious before) and hunt about for a convenient Place to fix their Hold-faſts, for ſupporting the Balls or Cones that they are to make, which they do in a moſt wonderful Mathematical Manner, with a Mixture of a Gummy Subſtance that ties all together; and when the looſe furzy Subſtance is taken off, and ſome of the Silk is wound off, the Remainder is ſo ſmooth and compact, ſhining like *Sattin*, that they are made uſe of for Artificial Flowers, and eſteemed the beſt of any thing yet known for that Purpoſe, for which (only) they are generally kept in *Boarding-Schools*. I weighed many hundred of theſe Silk-Balls or Cones, which I found to weigh from 35 to 40 Grains, with their *Aurelia*'s or *Chryſalis* within them.

June 27. They began to ſpin, having been hatched 7 Weeks and 3 Days; and in 4 or 5 Days finiſhed their laborious and curious Work: But their Balls were not fit to be removed until 8 or 10 Days.

July 7. Monſ. *Lachivre* began to wind off their Silk-Balls with a Machine that made great Diſpatch, winding much fine Silk in a Day: I found that an Ounce of Silk-Balls would make about a Dram of fine Silk; but to be more certain, I weighed out to the Winder 12 Pounds of Silk-Balls at four Times, and told the Balls in every three Pounds as followeth, *viz.*

The firſt 3 Pounds contained	812 Balls
The ſecond 3 Pounds contained	842
The third 3 Pounds contained	797
The fourth 3 Pounds contained	868

So that the whole 12 *lib.* Weight contained 3319 Balls.

Which when wound off, was found to yield and make one Pound and an Ounce, or 17 Ounces of fine Silk, and about 7 Ounces of coarſe Refuſe unwound, in all a Pound and half *Averdupois* Weight, or two Pounds *Troy*; which is as great, or greater making or yielding, as in any Part of the World, and the Silk as fine. I ſhewed it to a noted *Silk-Broker*, who ſaid it was *Italian* Silk (not knowing it was made in *England*) and worth about 20 *Shillings per* Pound, if I had never ſo many Bales of it, *&c.*

Now upon this Experiment finding that 3319 Silk-Balls would make one Pound and one Ounce of fine Silk, I was deſirous to know what Quantity of Silk might be expected from the Worms hatched from one Ounce of Eggs.

Of which to obtain the Knowledge, I made uſe of the following Method: By often weighing and telling, I found that one hundred Eggs weighed but one Grain, ſo that if one Grain contains 100, a Scruple muſt contain 2000, and a Dram 6000, and an Ounce, at 8 Drams to the Ounce, muſt contain 48000 Eggs. Now if every Egg hatch a Worm, and every Worm makes a Silk-Ball, there muſt be from one Ounce 48000 Silk-Balls; and if 3319 Balls will make one Pound and one Ounce of fine Silk (which by Experience I found they did) then 48000 Silk-Balls will make 15 Pounds and 6 Ounces of *Averdupois* Weight in fine Silk, or 18 Pounds and 8 Ounces of *Troy* Weight, which is very conſiderable. And in the ſame Proportion, one Pound of Silk-Worms Eggs will produce Worms ſufficient to make above 180 Pounds of Silk. But allowing for Caſualties, and ſuppoſing but 12 Pounds of fine Silk made from the Worms and their Silk-Balls, produced from an Ounce of *Silk-Worms* Eggs; it will be found much to exceed moſt Countries, according to *Auguſtino Gallo*'s Computation: For he ſaith, that in the Southern Parts of *France*, *viz.* *Languedoc* and *Provence*, they make but 7 or 8 Pounds of Silk from *Silk-Worms* hatched from an Ounce of Eggs; and in *Breſcia* in *Italy*, but 8, 9, or 10 Pounds of Silk from an Ounce; only in *Calabria*, where the *Silk-Worms* and their Eggs are larger, they make 11 or 12 Pounds of Silk from an Ounce of Eggs; which ſtill doth not exceed, nay hardly comes up to what we make in *England*.

As to the Charge and Expences of making the aforeſaid Quantity of Silk in *England*, different from that of other Places, I ſhall be able to give you a more particular Account in my next Experimental Obſervations.

I have only this to add, That Experience hath taught me how to hatch *Silk-Worms* twice in a Year, ſo as to have two Crops of Silk in one Year. And that the *Mulberry* Trees will have Leaves in *England* twice in a Year, without Prejudice to either Tree or Fruit, is moſt certainly true.

On the Silk *of* Spiders, *by Mr* Bon. n. 325. p. 2.

VI. It is not (I think) improper to give a general and curſory Account of the Spider, before I enter on the Deſcription of it's Silk. I ſhall therefore reduce all the different Sorts of this Inſect to two Principal Kinds, *viz.* ſuch as have long Legs, and ſuch as have ſhort Ones: The latter of which furniſhes the Silk I am going to ſpeak of.

In reſpect of their particular Differences, they are diſtinguiſhed by their Colour, ſome being Black, others Brown, Yellow, Green, White; and others of all theſe Colours mixed together.

They differ likewiſe in the Number and Poſition of their Eyes; ſome having ſix, others eight, and others ten, differently placed upon the Top of the Head, as may eaſily be ſeen by the naked Eye, but much better by the Help of a Glaſs. Theſe are the principal Differences, they being alike in other Reſpects, as their Body, which Nature has divided into two Parts: The Fore-Part is covered with a Shell, or hard Scale ſet with Hairs; it contains the Head and Breaſt, to which are fixed it's eight Legs, which may be called their Arms; and two Claws, armed with two crooked Nails, and joined by Articulations to the Extremity of the Head: With theſe Claws they kill the Inſects they feed on, their Mouth being immediately underneath them. They have likewiſe two ſmall Nails at the End of each Leg, and a ſpongy Subſtance between them, which undoubtedly is of Service to them when they go upon ſmooth Bodies.

The hinder Part of the Body of this Inſect is joined to the Fore-Part only by a ſmall Thread, and covered with a thin Skin, on which are Hairs of divers Colours; it contains the Back, Belly, Parts of Generations, and the *Anus*. I ſhall apply myſelf more particularly to the Deſcription of the *Anus*, as being the Part from whence the Spiders draw their Silk; it not being my Deſign to give a general Deſcription of this Inſect, but only to ſpeak of their Silk, and the Uſefulneſs of it.

It is certain, that all Spiders ſpin their Thread from the *Anus*; about which there are five *Papillæ*, or ſmall Nipples, which at firſt Sight one would take for ſo many Spindles that ſerve to form the Thread: I have found theſe *Papillæ* to be Muſcular, and furniſhed with a Sphincter. A little within theſe I have obſerved two others, from the Middle of which iſſue ſeveral Threads, in a pretty large Quantity, ſometimes more, and ſometimes leſs, which the Spiders make uſe of after a very Mechanical Manner, when they have a mind to go from one Place to another. They hang themſelves perpendicular by a Thread, and turning their Heads towards the Wind, they ſhoot ſeveral others from their *Anus*, like ſo many Darts: And if by chance the Wind, which ſpreads them abroad, faſtens them to any ſolid Body (which they perceive by the Reſiſtance they find in drawing them in from time to time with their Feet) they then make uſe of this Kind of Bridge to paſs to the Place where their Threads are fixed. But if theſe Threads meet with nothing to fix on, the Spiders continue to let them out further, until their great Length, and the Force with which the Wind drives them, ſurpaſſing the Weight of their Bodies, they find themſelves to be ſtrongly drawn; and then making the firſt Thread, which they hung by, they let themſelves looſe to be driven by the Wind, and flutter on their Backs in the Air, with their Legs ſtretched out. And by theſe two Ways it is, that they paſs over Roads, Streets, and the largeſt Rivers.

One may himſelf wind up theſe Threads, which, by Reaſon of their being united together, ſeem to be but one, when they are about a Foot in Length; but I have diſtinguiſhed them into 15 or 20 at their iſſuing from the *Anus*. What is further remarkable, is the Eaſineſs with which this Inſect moves it's *Anus*, every way, by means of the many Rings that border upon it. This is abſolutely neceſſary for them, in order to wind up their Threads or Silk, which in the Female-Spider is of two Sorts; however, I believe this Inſect to be Androgynous, having always found the Signs of a Male in ſuch Spiders as lay Eggs.

The firſt Thread that they wind is weak, and ſerves them for no other Uſe than to make that Sort of Web, in which they catch Flies: The ſecond is much ſtronger than the firſt; in this they wrap up their Eggs, and by this means preſerve them from the Cold, and ſecure them from ſuch Inſects as would deſtroy them. Theſe laſt Threads are wrapt very looſely about their Eggs, and reſemble in Form the Bags of Silk-Worms, that have been prepared and looſened between the Fingers, in order to be put upon the Diſtaff. Theſe Spiders Bags (if I may ſo call them) are of a grey Colour when they are new, but turn blackiſh when they have been long expoſed to the Air. It is true, one may find ſeveral other Spiders Bags of different Colours, and that afford a better Silk, eſpecially thoſe of the *Tarantula*; but the Scarcity of them would render it very difficult to make Experiments upon them; ſo that we muſt confine ourſelves to the Bags of ſuch Spiders as are moſt common, which are the ſhort-legg'd Ones. Theſe always find out ſome Place, ſecure from the Wind and the Rain, to make their Bags in; as hollow Trees, the Corners of Windows or Vaults, or under the Eaves of Houſes. And by getting together a great many of theſe Bags, it was that I made this new Silk, which is no-way inferior in Beauty to common Silk. It eaſily takes all Sorts of Colours; and one may as well make large Pieces of it, as the Stockings and Gloves which I have made. I ſhall next proceed to ſhew the Manner how I prepared the Bags to make the Silk.

After I had got together 12 or 13 Ounces of theſe Spiders Bags, I beat them well for ſome time with the Hand and a ſmall Stick, to free them from Duſt. Then I waſhed them in warm Water, till the Water that came from them was clear. After this, I let them ſteep in a large Pot, with Soap, Saltpetre, and ſome Pieces of Gum-Arabick, and let the whole boil two or three Hours over a gentle Fire. Then I waſhed them again with warm Water, to free them from the Soap: And having let them dry for ſome Days, I looſened them a little between the Fingers, that they might be more eaſily carded by the common Silk-Carders, excepting that I cauſed them to uſe much finer Cards. By this means I had a Silk of a very particular Aſh-colour, which is eaſy to be ſpun, and affords a Thread much ſtronger and finer than that of common Silk: Which ſhew, that all other Work may be made of it: And there is no Reaſon to fear but that it will endure any Trials of the Loom, after having paſſed that of the Stocking-Weavers.

Having already ſhewn the Uſefulneſs and Poſſibility of making this Silk, the only Difficulty now lies in procuring a ſufficient Quantity of Spiders Bags to make any conſiderable Work of it. And this would be no difficult Matter, if we could breed Spiders as they do Silk-Worms; for they multiply much more, and every Spider lays 6 or 700 Eggs; whereas the *Papilio*'s, or Flies of Silk-Worms, lay but 100, or thereabouts: And of this Number we muſt abate at leaſt half, on account of their being ſubject to ſeveral Diſeaſes, and are ſo tender, that the leaſt Matter hinders them from making their Bags. Whereas on the contrary, the Eggs of Spiders hatch of themſelves, without any Care, in the Months of *Auguſt* and *September*, in 15 or 16 Days after they are laid; and the Spiders that laid them, die ſome time after. As for the young Spiders that are bred from theſe Eggs, they live 10 or 11 Months without Eating; and continue in their Bags, without growing either bigger or leſs, till the hot Weather forces them to come forth and ſeek Food. The Reaſon of this is plain and natural: For all Inſects, and a great many other Animals, as Bears, Serpents, Mountain-Rats, *&c.* that lie hid during the Winter, abound with a viſcid Matter, which is not eaſily put in Motion: So that it is not ſtrange, that young Spiders ſhould live in the Cold Weather upon their own Subſtance, without any Loſs of Spirits. But as ſoon as the warm Weather comes, it puts in Motion this Matter, and forces them to ſpin, and run from Place to Place in Search of Food: And as ſoon as they begin to eat, one may perceive them to grow bigger and bigger every Day. From whence we may certainly conclude, that if we could find out a Way of breeding young Spiders in Rooms, they would furniſh us with a much greater Quantity of Bags than Silk-Worms do: For I have always found, that of 7 or 800 young Spiders, there ſcarce died one in the Year; and, on the contrary, of an hundred young Silk-Worms, not forty lived to make their Bags.

I ordered to be brought to me all the large ſhort-legg'd Spiders, that could be found in the Months of *Auguſt* and *September*. Theſe I ſhut up in Papers, and put them into Pots, and covered the Pots with a Paper pricked full of Holes with a Pin, as were likewiſe the ſeveral

Papers that were in it, that the Spiders might have Air. I fed them with Flies; and ſome time after found, that the greateſt Part of them had made their Bags, of which I have now ſome by me.

But I more eaſily procured a great Quantity of them, by promiſing to pay the ſame Price for them by the Pound as for common Silk. This Advantage furniſhed me in a ſhort Time with a large Quantity: And they aſſured me, they found no Difficulty in getting them; and that if they were permitted to go into every Houſe, where they ſaw theſe Spiders Bags in the Windows, they could furniſh me with what I pleaſed. So that we may eaſily conclude, that there are Spiders Bags enough in the Kingdom, to make large Pieces of Work; and that this new Silk which I propoſe, is not ſo ſcarce or dear as common Silk was at firſt. And ſo much the more, by reaſon Spiders Bags, in reſpect of their Lightneſs, afford much more Silk than the others; as a Proof of which, 13 Ounces yield near 4 Ounces of clean Silk; 3 Ounces of which will make a Pair of Stockings for the largeſt-ſized Man. Theſe which I have made weigh but two Ounces and a Quarter, and the Gloves about three Quarters of an Ounce; whereas Stockings of common Silk weigh 7 or 8 Ounces.

Spiders *not Venomous.*

I can aſſure you, that Spiders are not Venomous, having been very often bit by them myſelf without any ill Conſequence. And as for their Silk, it is ſo far from having any Venom, that every-body makes uſe of it to ſtop Bleeding and heal Cuts; and indeed it's natural *Gluten* is a Kind of Balſam, that cures ſmall Wounds by defending them from the Air.

Their Silk is uſeful, not only in reſpect of the Manufacture it produces; but it's Uſefulneſs is much greater, and more eſſential, on Account of the Specifick Medicines that may be drawn from it. It yields by Diſtillation a large Quantity of Spirit and Volatile Salt; and I have found by comparing, that it affords at leaſt as much as common Silk, which of all mixed Bodies yields the moſt. This Salt and Volatile Spirit, which is drawn from the Spiders Bags, is very active, as may be judged by the following Experiments. It changes the Tincture of the Flowers of *Turnſole* into a beautiful green Emerald Colour. It congeals, and reduces to a Sort of Snow, the Diſſolution of Corroſive Sublimate; whereas the Volatile Alcalies, drawn from Human Scull, Hartſhorn, and divers others mixed Bodies, only render it white or milky. So that this new Alcali which I propoſe, being prepared after the ſame Manner as that which is drawn from the Bags of *Silk-Worms*, in making the *Engliſh Drops*, ſo famous over all *Europe*, may ſerve to make other new Drops, which may deſervedly be called *Drops of Montpelier*; which we need not ſcruple to make uſe of, with much greater Succeſs than the old ones, in Apoplexies, Lethargies, and all ſoporous Diſeaſes, by reaſon of their Activity: And they will be taken with leſs Regret, becauſe their Smell is not ſo fetid and diſagreeable. I ſhall not enlarge further on this Subject, but recommend to the Phyſicians and Chymiſts of this Society, the Care of inquiring into the other Uſes which Spiders Bags, and the Principles that are to be drawn from them by a Chymical *Analyſis*, may afford in Phyſick.

An Explanation of the FIGURES.

Fig. 25. *Shews the Belly of a Spider, with the* Anus, *and five* Papillæ, *from whence the Threads iſſue.* Fig. 25.

Fig. 26, 27. *The Side and Fore-part of the* Penis *of a Spider, as magnify'd by a Microſcope.* Fig. 26, 27.

Fig. 28. *The Follicle or Bag of a Field-Spider with a harder Shell, at the breaking of which the young Spiders come out mixed with the Silk.* Fig. 28.

Fig. 29. *The Follicle or Bag of an Houſe-Spider with a ſofter Shell, in which the young Ones are incloſed.* Fig. 29.

Fig. 30. *A Spider hanging on the Branch of a Tree, with it's Head turned againſt the Wind, and ſpinning out it's Thread, till it finds that it adheres to ſome Body, (as to the Wall here repreſented) by which Kind of Bridge it paſſes over Rivers,* &c. Fig. 30.

Fig. 31. *A Spider having broke the firſt Thread, by which it hung, and let out ſeveral others, is carried by the Wind, and floats in the Air with it's Legs extended.* Fig. 31.

VII. This curious Shell-Fiſh, *Fig.* 32. was ſent by Mr *Foſter* (a Regent in the College of *St Andrews*) to our College; ſeveral of them, he ſays, were taken upon the Sides of a Whale that was caſt in there. Such another was caſt into *Edinburgh Frith*, ſome 30 Years ago. I gave a rude Deſcription of the Shell of that I got, in my *Auctarium Muſæi Balfouriani*, publiſhed *Anno* 1697. but this hath the Animal in it.

Of the Pediculus Ceti, *by* Sir R. Sibbald, n. 308. *p.* 2314.

Fig. 32.

It is the *Balanus Balænæ cuidem Oceani Septentrionalis adhærens, D. Mart. Liſteri, Hiſt. Conchil.* The *Pediculus Ceti Bocconi*, who, for ought I know, was the firſt that mentioned it, in his *Recherches & Obſervations Naturelles.* His Deſcription of the Shell is better than the Figure he giveth of it.

The Shell approacheth to a Sexangular Figure, and conſiſteth of one Valve, in which Point it differeth from all the *Balani* I have ſeen: It hath no Spiral Circumvolutions nor Apex, but it openeth at both Ends; the Orifice of the upper End is narrower, and it is through it that it puts forth it's *Cirrhi* or *Brachia.* The Orifice of the lower End is much broader, and the Animal is lodged in it. The lower is divided, s *Boccone* obſerveth, into 18 Lines, which are raiſed, 12 of them are mple and ſtreight, and the other 6 are branched: The laſt are ſo aced, that two ſtreight Lines are betwixt each of them. There is a avity betwixt all of them, in which the *Cirrhi*, or Arms of the Aninal, are probably placed, tho' in this Subject, they ſtood in the Middle f the upper Part of the Shell, with their Ends contracted, as the igure ſheweth them; for the upper Orifice is deeper than the lower.

They were altogether within it; but we raiſed them with the Leg of a Compaſs to the Poſture that they appear in the Figure. There is an Opening from the under Part to the upper, by which theſe *Cirrbi* mount from the Head of the Animal. The Orifice of the upper Part is narrow below, but wide in the Middle, and then again contracts ſomewhat. The Body of the Shell is Convex; it hath 6 Diviſions, each conſiſting of 4 Tubes exuberant, which are narrower at the upper End, but grow ſenſibly wider towards the lower End: The utmoſt of theſe Tubes are narrow, the Middle are broader, all of them have *Striæ* croſſing them; the Diſtances betwixt the Parts of the utmoſt ſmooth and appear hollow; the Superficies of them are wider at the Top, and grow narrower ſenſibly towards the Bottom. All the Tubes are hollow in the Inſide, making Cavities betwixt the Lines, both ſimple and branched, which compoſe them. They ariſe from the Orifice in the Middle of the inner Part of the Shell, and proceed toward the Sides of it, the branched Part is neareſt the Side of the Shell. This is what I could obſerve of the Shell, upon both the outer and inner Side of it. To come now to the Animal: In the upper Part appeared ſomething like a Mouth gaping; the upper and lower Parts were both Semicircular, but narrower towards the Point of the Overture; they were membraneous, and took their Riſe from the Inſide of the Shell. The upper Lip, if I may ſo call it, was altogether membraneous, the lower ſeemed of an oſſeous Conſiſtence toward the Shell, and appeared like the *Dentes Molaries*: A little below the Mouth appeared the *Cirrbi*, which were continued with the reſt of the Body of the Animal. I doubt not, but when the Animal is alive, the under Part below the *Cirrbi*, doth reſemble the under Part of the *Molluſci*, of the Polypode Kind: This did reſemble the *Parenchyma* of a *Buccinum*, but was much firmer, and when it was preſſed, it yielded a fat Juice; it was white without, but blackiſh where it adhered to the Shell; it was all drawn up within the under Part of the Shell which it filled: It was ſomewhat exſiccated, and ſo I could not perceive any Diſtinction of Parts in it, tho' ſome are of Opinion, there may be *Viſcera* and Veſſels traced in it, when the Animal is newly taken. This is what I could obſerve of the *Parenchymous* Subſtance in the lower Part. You ſee in the Figure two ſinewy Bodies, which ariſe from the Sides of the upper Part of the Shell, the one exactly oppoſite to the other; they end as it were in two Claws; by theſe, it is like, the Animal attacheth itſelf to any thing; and by theſe it hung to the Whale; it can dilate and contract them as it pleaſeth: So it giveth us a new Sort of Creature of the *Polypus* Kind, which ſeemeth to be peculiar to ſome ſort of Whales in our Seas, this being the ſecond caſt in upon our Shore in my Time.

On the Death-Watch, *by*

VIII. Of theſe *Death-Watches* (or Inſects which make a Noiſe like the Beats of a Watch) I have obſerved two Sorts. One of them I find a very a very exact and true Account of in *Philoſ. Tranſ.* N° 245 †. The Inſect there deſcribed being leſs ſhy, and much bigger than the other I diſcovered ſome Years ago. This Year I caught many in *May*, in my Study: Two of which (a Male and Female) I kept alive in a little Box about 3 Weeks; and could make one of them beat whenever I pleaſed, by imitating his beating. At laſt one died, the other gnawed his Way out through the Side of the Box.

The Reaſon why I judge theſe to be Male and Female, is becauſe I have often by my Ticking Noiſe, invited the Male to get upon the other in way of Coition. That which I took to be the Male, was ſomewhat leſſer than the other, and was moſt free in anſwering my Beats. Before he got upon the other, he would beat very eagerly; and when he found that he was got up in vain, he would get off, and beat again eagerly, and then up again. From whence I gueſs theſe Pulſations to be the Way whereby theſe Inſects wooe one another, and find out, and invite each other to Copulation.

This Mr *Allen* hath taken no Notice of in his Relation, and therefore I preſume to add it to his accurate Account: From which I differ only in what he ſays concerning the Part with which the ticking Noiſe is made, which he ſays *is the extreme Edge of the Face, which may be called the Upper Lip*. But I obſerved the Inſect always to draw back it's Mouth, and beat with it's Forehead.

The other *Death-Watch*, is an Inſect, in Appearance, quite different from the laſt; which I lately diſcovered about the Beginning of this *July*. The other *Death-Watch* beateth only about 7 or 8 Strokes at a Time, and quicker: But this will beat ſome Hours together, without Intermiſſion; and his Strokes are more leiſurely, and like the Beats of a Watch. I have ſeveral Years obſerved theſe two ſorts of Beating, but took it to be made by one and the ſame Animal.

The *Inſect* which makes this long Beating, is a ſmall, greyiſh Inſect, much reſembling a *Louſe*, when looked on only with the naked Eye. For which Reaſon (for want of another Name) I call it *Pediculus Pulſatorius*. It is very nimble in running to ſeek it's Shelter when diſturbed. It is very common in all Parts of the Houſe, in the Summer Months.

They are extreamly ſhy of beating, when diſturbed; but will beat freely enough before you, and alſo anſwer you when you beat, if you can view them without giving them Diſturbance, or ſhaking the Place where they lie, *&c.*

I cannot tell whether they beat in any other thing, but I have heard eir Noiſe only in, or near Paper.

Concerning their Noiſe, I am ſomewhat in doubt whether it be made by beating their Heads, or rather Snouts againſt the Paper: Or whether it be not made after ſome ſuch Manner as *Graſhoppers* and *Crickets* make their Noiſe: I rather incline to the former Opinion. But my Reaſon of doubting is, becauſe I have obſerved the Animal's

E 2 Body

Mr W. Derham, n. 271. p. 832.

† Vid. ſupra V. II. C. VI. S. XXIX.

Body to ſhake, or give a ſudden Jirk at every Stroke, but I could ſcarce perceive any Part of it's Body to touch the Paper. 'Tis poſſible it might beat the Paper, and I not perceive it, by reaſon it's Body is ſmall, and near the Paper when it beateth, and it's Motion in beating is ſudden, and ſwift. For which Reaſons alſo, it is hard to perceive the Inſect to beat, without a very ſevere Eye: And therefore I made uſe of a Convex-glaſs, which, by magnifying, gave me much better Opportunity of obſerving.

This ticking Noiſe, I judge (as before) a wooing Act; by reaſon I obſerved another (after much beating) to come, and make Offers to the Beating Inſect; who (after ſome Offers) left off his Beating, and got up upon the Back of that other. When they had conjoined, he got off again, and they continued ſome Hours joined Tail to Tail, like Dog and Bitch in Coition. The Female (which I ſaw) was ſomewhat bigger than the Male, and lighter in Colour (inclining to a Yellow); but whether all are ſo, I know not.

I have often, heretofore, by the Noiſe, purſued the Makers of it; but have thought myſelf diſappointed, when I found nothing but ſome of theſe *Pediculi*, which I did not perceive to beat, and which I little imagined could have made ſo ſonorous a Noiſe, as I have heard ſome of them do, even as loud almoſt as the ſtrongeſt Beats of a Pocket-Watch. But lately finding a Piece of Paper in my Study, in which I was ſure the Beating was, and it being luckily looſely folded, ſo as to be viewed throughout, and ~~alſo~~ happening to lie in a good Light, I ſtrictly viewed it, but could only ſee ſome of thoſe *Pediculi*: And viewing them with a Convex-glaſs, I ſoon perceived ſome of them to beat, or make a Noiſe, with a ſudden Shake of their Body, as hath been deſcribed. And I am now ſo uſed to, and ſkilful in the Matter, as to be able to ſee, and ſhew their Beating, almoſt when I pleaſe, by having a Paper with ſome of them in it conveniently placed, and imitating their Pulſations; which they will readily anſwer.

Whether this Inſect changeth it's Shape, and becometh any other Animal, I know not, but I have ſome Cauſe (tho' very little) to ſuſpect that it becometh a ſort of Fly.

On the ſame, by the ſame, n. 291. p. 1586.

2.] The *Royal Society* having required my perfecting the Hiſtory of this Inſect, I think myſelf bound to comply, as far as I am able. And therefore I have procured a Draught to be made of that Inſect, both as it appeareth to the naked Eye, and as magnified with a Microſcope. *Fig.* 33. ſheweth it as ſeen with the naked Eye: *Fig*, 34. as magnified.

Fig. 33.

34 33 Fig. 34.

Theſe Figures, and only ſaying, it is very much like a *Louſe* in Shape and Colour, but runneth more nimbly, may be a ſufficient Deſcription of an Inſect common in every Houſe in the warm Months. For in the cold Seaſon of the Year, they hide themſelves in dry obſcure Places, and are ſeldom ſeen.

Some

The Generation of the Death-Watch

Some time after their Copulation, they lay their Eggs in dry, duſty Places, where they meet with leaſt Diſturbance. For in ſuch, and none elſe, I have found them. Theſe Eggs are exceeding ſmall, much ſmaller than the Nits of Lice; altho' Lice are not much bigger than our Inſect is. Theſe Eggs are white and ſhaped like Nits, but more tranſparent.

Theſe (as are the Eggs of all Inſects, that have fallen under my Cognizance, by the Warmth of Weather) are hatched by the Warmth of the approaching Spring; which is to them all one as an Incubation. About the Beginning of *March*, or, if the Weather be warm, ſooner, if cold and unſeaſonable, later, the Inſect is fully hatched, and can creep about.

At the firſt leaving their Egg-ſhell, they are exceedingly ſmall, ſo as ſcarce to be diſcerned by the ſharpeſt Eye, without the Help of a Convex-glaſs. I have with a Microſcope ſeen them crawling about, but could ſcarce perceive any Hairs, Feet, *&c.* But they rather looked like moving Eggs. I ſuppoſe they were covered with their Shells, and but juſt breaking out of them. At the firſt leaving their Shells, they are leſſer than their Eggs, altho' the Eggs are ſcarce viſible without a Microſcope.

Theſe young *Death-Watches* are perfectly like the Mites in Cheeſe, a few Hairs of the Breech only excepted. I could not perceive any Difference between them, when much magnified with a Microſcope, but only that Mites have more Briſtles about their Breech.

In this Shape they continue 6 Weeks, or 2 Months, feeding on divers Things they can meet with. They being ſo very like Mites, I cannot poſitively ſay, but have great reaſon to think, that they were Swarms of young *Death-Watches*, which I have ſeen feeding on dead Flies, and other Things in *March*, *April*, and *May*. Theſe are a great Annoyance to me, in devouring or defacing my Specimens of Inſects. And there are ſcarce any ſorts eſcape theſe voracious, tho' minute Animals.

From this *Mite State*, they grow gradually to their more *perfect State*. When they become like the old ones, they are at firſt very ſmall, and then can run about more ſwiftly than when Mites, in which Mite-State they creep but ſlowly.

Thus having traced the Generation of our Inſect through it's ſeveral Stages, and finding it to be as ſolemn and regular as any in Nature, even of that of an human *Fœtus* itſelf, I cannot eaſily paſs over the Buſineſs of *Æquivocal Generation* without a Reflection. If this Inſect was ever taken Notice of by the Ancients (as I do not find it was, either by them, and but little by the Moderns) they would, no doubt, have made it's Production to be (like that of other Inſects, *viz.*) out of Duſt, or ſome other Thing, in which it's Eggs were laid. But as in this, ſo in the Generation of all other Inſects, yea, all Animals, it hath been obſerved, that Nature is very regular and uniform, in deriving the Offſpring, not from corrupted Matter, but from Animal Parents of the ſame Species. As for *Gnats*, 'tis wonderful to ſee in what curious and exact Order the ſeveral Species of Gnats lay their Spawns. The curious and ingenious *Swammerdam*, and other Authors, mention but two Kinds of Gnats; but I have collected near 30 diſtinct Species of them, and have obſerved one Species to lay it's Eggs in this, another in that, another in a third, and others in other Forms; and I could not but admire to ſee how artificially the Spawns are tied in the Water; how (after the Sun's Incubation, if I may ſo call it) the Spawn is diſſolved, and the Eggs, with a Part of the Jelly in which they were incloſed, fall to the Bottom of the Water, and there ſtick on Stones and other Things; where they are hatched into *Nymphæ*, as various as the Gnats themſelves, ſome being red, green, white, or other coloured Worms, ſome of a quite different Shape; and laſtly, how the *Nymphæ* become *Aureliæ*, and the *Gnats*, both *Male* and *Female*, of every Species.

The Noiſe, or Ticking, *and Copulation.*

I have ſhewed their *Ticking* Noiſe to be a *wooing Act*, and that it is commonly about *July*. I ſcarce ever heard them beat but in *July*. But all, or the greateſt Part of *July* they beat, and in the Beginning of *Auguſt*. I have heard them till *Aug*. 16. but never later. But they do not every Year beat alike; but ſometimes ſooner, ſometimes later; ſometimes much, ſometimes little, according as the Year exciteth or favoureth, or hindereth their Venereal Inclinations: Of which we have ſufficient Example in the laſt, and preſent Year. The laſt Year, 1702, they ticked very much, ſcarce ever ceaſing either Day or Night. But this Year, 1703, as little. And I have obſerved as great a Difference in the Fertility of other Inſects the laſt, and this preſent Year; and no doubt but the ſame befel our *Death-Watch*. The moſt remarkable Difference, or at leaſt the moſt perceivable, was in Inſects bred in the Waters; of which I ſhall ſay a little, becauſe it ſerveth to illuſtrate what I am ſaying about the *Death-Watch*.

Now as to the Waters, it might be obſerved, that laſt Year they extremely abounded with Animalcules. You could hardly find any ſtagnating Water without many Animalcules of many ſorts therein, viſible even to the naked Eye. And if you viewed but a ſmall Drop thereof with a good Microſcope, you might ſee very many more; ſo that the Water looked in a manner as if alive.

But this Year I have found ſome, but very few of thoſe Animalcules, either without or with a Microſcope. The *Pediculi Aquatici* (which *Swammerdam* calls *Pulices Aquatici Arboreſcentes*) which are ſeldom barren, were for Inſtance leſs numerous in our Waters this laſt Summer, than the Summer before, by many Myriads, or at leaſt leſs venereally inclined, or leſs pregnant, as I judge, from there being vaſtly leſs Numbers of them congregated together. For the Reaſon of their aſſembling in ſuch vaſt Numbers, ſo as to diſcolour the Waters, I have diſcovered to be either for Venery, or to diſcharge their Young, at leaſt out of the Receptacles wherein they were lodged, or to caſt their *Exuviæ*, or Skins, or for all together. For I have ſeen all theſe Things performed at that time, if I miſtook not.

Now as theſe moſt numerous fertile Inſects, ſo our *Death-Watch*, in all Probability, had it's venereal Flames abated by the Indiſpoſition of the preſent Year; and conſequently have clicked but little this Year.

The Reaſon of all which I take to be the Wet of the Spring-Months, eſpecially *May* and *June* laſt. In the former of which, there fell more Rain here at *Upminſter*, than in any Month of any Year ſince 1696. This vaſt Wet might not only chill and ſpoil the Eggs of the Water-Inſect, but alſo indiſpoſe the Air, and by ſome ſuch Means affects all other Inſects, and renders them leſs prolifick.

And not only Inſects, but even Corn itſelf, we have, to our Coſt, found to be leſs fruitful than the Winter before gave us Hopes of.

After that they have ſpent ſome Time in *Ticking*, they *Copulate*. I do not remember that I ever found them in *Copulation*, till a Week or Fortnight after their *Ticking*. But 'tis very probable that they do copulate in the Time of their *Ticking*, as I have formerly ſhewn the *Scarabæus Death-Watch* to do.

It's Food.

I have already ſaid, that the young *Death-Watches* feed upon dead Inſects, and the ſame I have ſeen the old ones do alſo, as alſo upon divers other Things, *viz.* Biſket, Tallow, *&c.* nay, *Duſt* itſelf (altho' it may ſeem to us an improper Food for ſuch Animalcula) doth not eſcape the Palate of our *Death-Watch*. For which Reaſon probably it is, that they delight moſt in duſty Places, not in all, but ſuch as are fouled with light Duſt, ſuch as flieth in ſweeping, and falls on Shelves, and other Places ſeldom bruſhed down.

But in this their eating *Duſt*, there is one Thing I have obſerved, which to me ſeems very remarkable, *viz.* their Curioſity in chooſing it. For they do not eat all that they meet with, but are very nice, and curious in ſelecting what beſt ſuiteth their Palate. I have ſeen them turn the Duſt, and hunt among it with great Pains and Diligence.

From hence I conclude, that our *Death-Watch*, and other Creatures too that eat Duſt, are not nouriſhed by the pure terrene Particles of Duſt, but rather by more nutritive Particles intermixed with Earth. For Duſt contains very different Particles, ſome of Earth, ſome the Powder of Animals, ſome Crumbs of Bread, Cheeſe, and other Proviſions reduced to Powder, ſome Particles of Fruits, or our Spittle, Snot, *&c.* dried and reduced in like manner into Powder. Now theſe very Particles of the Duſt, are doubtleſs what the *Death-Watch* hunteth after (like Ducks in Mud) when he turneth up, and diveth among Heaps of Duſt. Nay, ſo far probably is his Food from being corrupted, or fouled by the terrene Particles, that it is perhaps better prepared, by thus being in Duſt. Before in a Maſs, in the Body, it was more ſolid, and required the Trouble of being gnawed out and maſticated, but being thus in Powder, it is ready ſubtiliſed, fit for

Deglutition. And altho' Duſt to us ſeems to be nothing but Dirt pulverized, or if conſiſting of ſuch Particles alſo as I have ſaid, yet to be ſo blended and mixed with Dirt, as to be inſeparable: But yet it is otherwiſe with our Inſect. I have ſeen them through a Microſcope ſelect the Particles of Duſt, and eat ſome, and reject many others: Which they can eaſily do, being ſmall themſelves, and having accurate Organs of Sight, Smelling and Feeling, as well accommodated to Duſt, as the Organs of Ducks and Hogs are to find their Food in Dirt.

From this Account of the Food of the *Death-Watch*, I cannot forbear remarking on a common Error about the Food of ſuch Creatures as have been, or are thought to live upon Things ſcarce nutritive of themſelves. Thus the *Chamæleon* was thought to live upon the Air, when Flies are eaten by him: Fiſhes to live upon Water, or at leaſt to ſatisfy a perpetual Thirſt therewith; whereas their ſucking Water is breathing, and their Food as little of Water perhaps, as other Creatures uſe. So *Earth-Worms* doubtleſs eat Earth, but in all Probability it is Earth made of rotted Roots, Plants, or ſuch nutritive Things, not pure Earth. Nay, ſo neceſſary is good ſubſtantial Food to all Animals on this our Earth, that I am of Opinion (from I think very good Reaſon) that there is no Animal but what hath it's proper Food, even the moſt minute Inſects whatſoever, and that alſo none of the four Elements, altho' therewith mixed. Concerning which, an Inſtance of mine may be found of the *Food* of *Water Animalcules*, which Mr *Ray* hath thought fit to publiſh this Year, in his late Edition of his excellent Book, *Of the Wiſdom of God manifeſted in the Works of the Creation*, p. 431.

But to return to the Food of our *Death-Watch*, or rather the Time they abſtain from Food; which I ſuppoſe they do all the cold Months. You may perceive them gone into their *Latilula* very ſoon; as ſoon, or ſooner than the Swallows, where doubtleſs they live all the Winter, without Food, as many other Animals do.

I ſaid before, they harbour all the Winter in dry obſcure Places; I have found them lying deep in undiſturbed Duſt, but never in ſhallow Duſt, as tho' they had a Foreſight of the Danger and Inconveniencies of cold froſty Weather.

I met lately with a Paſſage in the *Athenian Oracle* (which I think my ſelf obliged to take notice of) concerning the Noiſe of this *Pediculus Pulſatorius*. The Gentlemen of that Society ſay, They enquired into ſuch a Noiſe, found a little Hole eaten in the Wall; that with a Paper-Trap they catched the Inſect which they concluded made the Noiſe, and that it was a ſmall ſort of Spider. But I have been myſelf ſo often impoſed upon in the ſame Nature, before I actually ſaw the Truth, that I aſſure myſelf thoſe *Gentlemen* were ſo alſo. I have in hunting the Noiſe ſometimes diſcovered a Spider near, ſometimes the ſmall *Scarabæus Lignivorus*, which eateth the little Holes in the Wood, which hath been commonly taken for the *Death-Watch*. This I gueſs'd might make the *clicking* Noiſe, and therefore with all Nicety watched them; but found, that altho' the Beating continued, the Inſects did not ſtir in the leaſt, nor were any way affected: So with all Diligence I ſtill purſued my Enquiry, which was the Cauſe of my diſcovering the real Thing. And I have ſo many Years acquainted myſelf with all the Noiſes of the *Death-Watch kind*, that I can aſſure every one, that there are but two Sorts of them in thoſe Parts of *England* where I have been; *viz.* the few quick Beats of the *Scarabæus Sonicephalus* (as *Swammerdam* hath named it) deſcrib'd by Mr *Allen*; and the longer and more leiſurely Beats of that Inſect I have been now ſpeaking of. There are indeed *Scarabæi*, Graſhoppers, Crickets, *&c.* which make peculiar Noiſes. But there are no Creatures which make theſe regular clicking Noiſes (like the Beats of a Pocket-Watch) but only that *Scarabæus Sonicephalus*, and our *Pediculus Pulſatorius*.

Of the Migration *of Birds, by Mr* W. Derham. n. 315. *p.* 123.

IX. I would recommend it to the *Society*, that they would themſelves, or procure their Friends to obſerve, in all Parts of the Kingdom, and note down the very Day they firſt ſee or hear of the Approach of any of the Migratory Birds. And it may be convenient alſo to obſerve how the Winds ſit at the ſame time, eſpecially towards the Sea-Coaſts. From which Obſervations, when compared together, we may probably make a good Gueſs which way thoſe Birds come, whether fromward the Eaſt, or any other Point. The *Jynx* or *Wryneck*, (for Inſtance) which I take to be undoubtedly a Bird of Paſſage, I firſt heard this Year on *March* 29. the Wind Southerly, South Weſterly, that and the preceding Day; but Eaſterly before. The *Certhia* alſo, or Creeper, (which leaveth us in *Eſſex* until the Spring, but whether a Bird of Paſſage I can't tell) I ſaw firſt on *March* 13. the Winds that Day varying from S. to N. but blowing ſtrongly the Day before from the Weſtward. Now if thoſe Birds in the more Weſterly, or any other Part, at 100, 200, or more Miles diſtance, ſhould be diſcovered to come ſooner or later, we might conclude, that accordingly they came fromward the Eaſt or Weſt, or other Point, eſpecially if about the ſame time the Winds ſeemed to favour their Flight. Theſe are all the Migratory Birds I have ſeen as yet this Year But for a farther Sample, I ſhall annex my Obſervations of laſt Year, *viz.* The *Swallow* came *March* 31, making a great Outcry at his Approach, as if he ſaw ſomething ſtrange. *April* the 1ſt. the *Jynx* firſt yelped here. *April* 4. I firſt eſpied the *Ruticilla*, or *Redſtart*. The 5th, I ſaw the *Martin*. The 6th, the *Nightingale* firſt ſang with us. The 7th the *Cuckow* I was told was heard, and the 9th I heard it myſelf. The 17th, I heard the *Swift* or *Black-Martin* ſqueek in a Hole in my Houſe in which it hath quietly built for ſeveral years: But it being cold Weather, he did not fly abroad till ſome Days after. As to the Coaſt of the Winds about thoſe times, they may be ſeen in my Tables.

Strange Birds in Wales, *by Mr* E. Lhwyd, n. 334. *p.* 464.

X. There came in *May* 1696. into *Cardiganſhire* two ſtrange Birds (as I gueſs by the Deſcription given of them) of the *Aquatick Fiſſiped* Tribe. They ſay they were almoſt two Yards tall, and of a whitiſh Colour, with the Tips of the Wings dark; I take them to be ſome ſort of Exotick *Crane.*

In *September* 1694. there came a Flock of Birds (about an Hundred) to a Hemp-Yard, at a Place call'd *Lhan Dhewi Velfrey* in *Pembrokeſhire*; and in one Afternoon deſtroyed all the Hemp-ſeed: They deſcribed the Cocks to be all over red as Scarlet; the Hens greeniſh above, and red underneath, about as big, or little leſs than Black-Birds; with Bills more ſtubbed and bigger than that of a Bull-Finch. I ſuſpect theſe to have been *Virginia* Nightingales.

Ibid. *p* 466.

It was Mr *Roberts* (who is mentioned in the laſt Edition of *Camden* in *Pembrokeſhire*) that gave me the Account of theſe *Scarlet* Birds. He ſaid they were extraordinary tame, or at leaſt ſo intent upon their Feeding, that they being forced from their Places, they would not remove above 2 or 3 Yards. The Cocks, he ſays, were of a deep ſcarlet Colour, without any Diſtinction in the Feathers of their Wings, that they could diſcern, excepting that the Tail and the lower Part of their Belly, were a little paler. The Hen had a lovely ſcarlet Breaſt, her Head and Back grey. He is curious in Birds, and ſays, He never ſaw any that in the leaſt reſembled them as to their Colour.

A Puppy *receiving no* Nouriſhment *at the* Mouth, *by Mr* S. Brady, n. 304. *p.* 2176.

XI. This Puppy was whelp'd in *November* 1704. at it's full Growth, had no Appearance of a Mouth at all, and liv'd ſome time after it was parted from it's Dam: When the Skin was pull'd off the Head, there appear'd not the leaſt Paſſage thro' it: The Head was one ſolid Bone without Sutures, ſomewhat round, as a Man's Scull, with a little Prominence in the Fore-part, reſembling the *Os Naſi* of a Man, but without any Paſſage: It had no Place for Eyes, nor *Meatus* for Ears, only the outward Reſemblance of one on each ſide unpenetrated, and placed lower than naturally: No *Jaw-Bone*, nor Conveyance to the Top of the *Larynx* and *Pharynx*, but from thence downward was natural. I ſtuffed the Skin for my own Satiſfaction.

This is, I think, a Confirmation that the Nouriſhment of the *Fœtus* in the Womb is perform'd by the *Umbilical* Veſſels only, without the Aſſiſtance of the Mouth.

Of a monſtrous Calf, by Dr A. Adams. n. 311. *p.* 2414.

XII. I have made what Search I could about that monſtrous Calf, and I find that it's Dam was all that a poor Man had; who finding his *Cow* unable to caſt her Young, employ'd his Neighbour to aſſiſt her; this Man not thinking of any ſuch Rarity, us'd ſuch violence upon the Monſter, that He disfigur'd the Head in pulling it from the *Cow*; notwithſtanding it lived three Hours, and in all Probability had lived till this Time, if the Aſſiſtant had made uſe of the beſt Method in that Caſe: Then it dy'd, and being ript up, was found, to the beſt of my Information, to be in all reſpects like any other of the ſame kind, excepting the Wings, which to me ſeem to be Bags formed out of the Membranes, torn and diſtended from the adjacent Parts, and by freſh Supplies from the circulating Fluids were enlarged to the Bigneſs you now ſee them in. Whether the Subſtance contained in theſe Bags was Fibrous and Muſcular, or only a Heap of Veſſels inclos'd in a *Cyſtis*, like the *Placenta*, the Aſſiſtant's Ignorance, and the Diſtance of Time and Place, it being three Years ago, make me uncapable to account for: The Place is called *Wolterton* in *Norfolk*.

[*The Skin of this* Calf *is now in the Repoſitory of the* Royal Society, *given to the ſame by Dr* Adams.]

The Head of a Monſtrous *Calf, by Mr* J. Craig. n. 333. *p.* 429. Fig. 35.

XIII. A Butcher brought me in the Head of a monſtrous Calf (which he had taken out of a Cow's Belly). The upper Jaw was divided into two Halfs, as far as to the *Dura Mater*: Each half had a diſtinct Eye and Noſtril: And the Under Jaw was bent round ſo entirely, that it lay exactly between the two Halfs of the Upper Jaw, making the Tongue lie upon the Forehead, about two Inches above the Teeth of the Under Jaw, and in the Fiſſure of the Upper Jaw. This Preternatural Diviſion of the Upper Jaw was not covered with Hair, but with a *Cutis* of a florid Colour. The Calf was come to it's full time, and made great ſtrugglings when the Butcher knock'd the Cow on the Head; which by ſome Symptoms they judged would have dy'd in the Calving. It was ſo large a Calf, that an old experienc'd Butcher ſays, that he never ſaw but one ſo large at Calving: The Legs and Feet were as big as an ordinary Calf of ſix Weeks old. If the Butcher had had the Senſe to have opened the Cow immediately upon killing her, in all Probability the Calf might have been ſaved alive.

I opened the Calf's Head, and after I had cut the Skin (for there was no *Cranium*) that was expanded over the fore-part of the Cavity containing the Brains, I was ſurpriz'd to find that there was very little Brains in it; I am ſure not ſo much as in a Rabbet: The whole Cavity is not big enough to hold an ordinary Walnut. This to me is the moſt ſurpriſing *Phænomenon* of this monſtrous Head. The Butcher thruſting his Finger raſhly in, ſpoilt any Obſervation I could have made upon the Brains. I have made him cut all the Fleſh off, and hung up the Bones in their natural Poſition.

P. S. I had almoſt forgot, that a Week before the Cow was kill'd (upon apprehending that ſhe had the Dropſy) the Butcher cut a Hole in her Belly, a little above the Udder, and thruſt in his Hand; but finding nothing extraordinary, ſowed up the Hole, and the Cow eat her Hay, and was as well as before.

The Yellow Gurnard *de-*

XIV. If we may juſtly infer an Identity of *Species* in Fiſhes, from the Likeneſs of their Fins, we have then ſome ground to conclude, *ſcribed by* Dr E. Tyſon. n. 293. *p.* 1749. Fig. 36.

that this Fiſh, (I am giving an Account of, and which has not hitherto been deſcribed by any as I know of) ought to be referred to the *Gurnard* kind. Not but that in many Particulars, and thoſe very remarkable too, it differ'd from it. However, not finding any other *Species* it agreed with better, and that the Fiſhmonger that ſent it to the *Royal Society*, not knowing any Name 'twas called by where taken, which was about *Haſtings* in *Suſſex*; I ſhall take Liberty to call it the *Yellow Gurnard*, or *Cuculus Lævis Cæruleo-flaveſcens, cui in ſupremo Capite Bronchiarum Opercula*; and that I had ſome Colour of Reaſon for doing this, will appear, when I have compared this Fiſh with the *Red Gurnard*, and ſhewn wherein they agreed or differ'd.

And firſt of all, as to the general Shape of their Bodies, I found an Agreement enough. In both, the Head was the biggeſt Part; the Body thence gradually ſtill leſſening and growing taperer, as it approached the Tail; where 'twas very ſmall in both. The *Yellow Gurnard* meaſured eleven Inches in Length, whereof the Tail is two. The Girth of the Head was four Inches and a half.

The Fins, as to Number and Situation, or placing on the Body, were exactly the ſame in both; I ſhall therefore omit their Deſcription, and only take notice wherein they differ'd in other Cirucmſtances. As in the Fore-Fin on the Back of the *Yellow Gurnard*, there were four or five *Radii*, or Spines; whereof the firſt was ſix Inches long; the next about two; the others ſhorter: In the *Red Gurnard* in this Fin, were ſix ſtrong bony Spines, ſharp-pointed; whereof the ſecond from the Head being the longeſt, was only a little above an Inch, and the reſt not much ſhorter. Note, the *Red Gurnard* I had to compare with, was but ſmall, and ſomething leſſer than the *Yellow* one.

In the hinder Fin of the Back of the *Yellow Gurnard* there were nine *Radii*; in the *Red Gurnard* fourteen: in both, the *Radii* near the Tail were the longeſt; thoſe in the *Yellow Gurnard* being two Inches and a half long.

The Membrane that joined theſe *Radii* of the Back-Fins, as to Colour differ'd very much in theſe Fiſhes. For in both the Back Fins of the *Red Gurnard* this Membrane was all of a white tranſparent Colour. In the Fore-Fin of the *Yellow Gurnard*, the Membrane was yellowiſh, with blue Spots, and ſome edged with black, and the Membrane of the hinder Fin was of a faint bluiſh Colour, with four yellow Liſts or Streaks about a line broad, running the whole length, as in the *Figure*. Fig. 36.

The *Pinnæ Bronchiales* (whereof there were two of each Side, and their Situation in both, the ſame, the uppermoſt being inſerted Perpendicular, the lowermoſt Horizontal to the Body) differ'd likewiſe in Colour: For in the *Yellow Gurnard* the uppermoſt Fins were white; the lowermoſt of a dark blackiſh Colour with ſeveral beautiful long Spots of an Azure Blue. In the *Red Gurnard*, the uppermoſt Fins were of a dark reddiſh Colour, the lowermoſt white; but here between theſe two Fins I obſerved three naked *Cartilaginous Radii*, which are not in the *Yellow Gurnard*, and are well expreſſed in *Salvianus*'s Figure of the *Red Gurnard*.

The Fin on the Belly was placed exactly alike in both. The *Yellow Gurnard* here had nine *Radii*, and it's Membrane of a darkiſh Blue Colour. The *Red Gurnard* had 17 or 18 *Radii* here, and it's Membrane tranſparent white. The Tail in both was much the ſame.

Over the *Anus* in the *Yellow Gurnard* was a ſlender pendulous Body, which was not obſerved in the *Red Gurnard*.

The Colour of the Body of theſe two Fiſhes differed likewiſe very much; and I know not, but that it may be a Property in this Species to vary in Colours more than other Fiſhes do. The Belly of the *Red Gurnard* was of a Silver Colour, and ſome Part of the Sides near the Belly: the reſt, and the Backand the Head, were of a reddiſh Colour. In the Head there ſome ſmall whitiſh Spots. The Belly of the *Yellow Gurnard* was white; but under the lower Jaw was black. The Sides and Back were yellowiſh; but between the Belly and Sides there ran a blue Streak or Liſt about a Line and a half Broad from the Head to the Tail; and a little higher on the Sides, where was a Chain of blue Spots the Length of the Fiſh; for on the Sides of the Head I obſerved theſe blue Spots; only from the Eyes to the end of the *Roſtrum* the Spots were of a deep yellow Colour. There being therefore ſo much of blue and yellow over the greateſt Part of the Body of this Fiſh, I have given it the Epithet of *Cæruleo-flaveſcens*; for where the Ground is blue, the Spots are yellow, and where yellow, the Spots are blue.

Tho' hitherto there ſeems a tolerable Agreement between theſe two Fiſhes, yet in the Remarks I ſhall now add, the Diſagreement will appear greater. For the *Yellow Gurnard* was without Scales, I therefore call it *Lævis*. The *Red Gurnard* had not only Scales on the Back, but likewiſe a Ridge of ſpiny Scales all along the Sides; as alſo of each Side the Back Fins were placed the like ſpiny Ridges or Scales. But the Belly ſeemed almoſt ſmooth, and had but few Scales, and thoſe very fine; and indeed thoſe on the Back were much ſmaller than theſe in moſt other Fiſhes. If Mr *Leeuwenhoek*'s Obſervation be true, that even the *Anguillous* Kind are ſcaly, then the Difference will not be ſo great, the one having *Membranulous* Scales, the other *Bony*. Or it may be our Subject is an *intermediate Species* between the *Gurnard* Kind and ſome other.

And this I am the more apt to believe, becauſe, tho' it has Gills of each Side, yet it had not thoſe *Apertures* at the Sides of the Head that the *Red Gurnard* had, and is common to moſt Fiſhes but the *Cetaceous* Kind; but, like them, the *Yellow Gurnard* had two *Apertures*, or large *Foramina*'s placed on the hinder Part of the Head, an Inch beyond the Eyes, at which it ſpouts out the Water. By blowing into theſe *Holes*, I extended the Cavites where the *Gills* lay; and obſerv'd that over theſe Cavities were placed a flat Bone, which by the Contraction of it's Muſcles might ſerve to force the Water out, and perhaps is aſſiſted in this Action by another looſe Bone that lies over it, whoſe Edges are jagged or indented, as in the *Figure*: At which Place, in the *Red Gurnard*, I obſerved a ſtrong ſharp Spine.

Theſe *Foramina* in the Head of this Fiſh is a thing ſo very remarkable, that it may be looked upon as a *Characteriſtick*; nor do I know at preſent with what other Fiſh to parallel it: For the *Cetaceous* Kind, that have Spouts in their Heads, have not *Bronchiæ*, but *Lungs*. The better therefore to diſtinguiſh this Fiſh, I have added this Particular to it's name; and could wiſh, that inſtead of thoſe ſilly Names that are given to moſt Fiſhes, others were found out, that might be more expreſſive; and that their *Claſſes* were ſo ordered by ſuch *ſpecifick* Differences, that one might better know where to range them, in as good Perfection as is now done in the *Vegetable* Kingdom that is more numerous.

But to conclude; I obſerved the Eyes in the *Yellow Gurnard* were placed more on the top of the Head, and the Skin here covered almoſt half of them, like an *Eye-lid*; which I did not obſerve in the *Red Gurnard*, whoſe Eyes were placed more at the Sides of the Head. The Head likewiſe of the *Red Gurnard* was more protuberant, in the *Yellow* flatter. The End of the *Roſtrum*, the Teeth and Tongue in both were exactly alike; only in the Palate of the *Yellow Gurnard* I obſerved two *Cartilaginous* Bones, whoſe Edges were bended downwards, from the Palate, and did ſerve, as I ſuppoſed, for the hooking in and ſtaying the Cartilage of the Tongue, when it makes a Compreſſion for the forcing out the Water by the *Foramina* of the Head: Which Contrivance I did not find in the *Red Gurnard*, not having the like Occaſion for them.

This Fiſh being ſtale, I had not Opportunity of diſſecting it, and obſerving the *Viſcera*: And ſhall only further add, that the Gills had four Oſſeous *Radii* of each Side. But of theſe more, if I happen to get another of this Sort.

Experiments with Poiſons *on Animals at* Montpelier, *by* W. Courten, *Eſq*; n. 335. *p.* 485. *With* Dutch *Nightſhade, Hemlock, Wolf's-Bane.*

XV. In the Month of *July*, *Anno* 1678, we gave a Dog a piece of Bread, ſteep'd in two Ounces of the Juice of *Dutch Nightſhade* [*Solanum Batavicum*] expreſs'd from the green Plant, and mix'd with Cheeſe, As far as we could perceive, he did not ſeem to receive any manifeſt Damage from it.

The ſame Doſe of the Juice of the Leaves of *Hemlock* [*Cicuta*] had no more effect. We gave alſo the ſame Dog a pretty large Root of *Woolf's-Bane* [*Aconitum Pardalianches*] together with the Leaves and Flowers of the ſame Plant bruiſed and mixed with Fleſh; which did him no hurt.

White Hellebore.

Two Drachms of *White Hellebore* [*Helleborus albus*] very much diſorder'd him, and cauſed Reachings, Suffocations, Vomiting, and voiding of Excrements. This Dog (as afterwards we often obſerved in others that had taken the like corroſive Medicines) whether becauſe he was not able to endure the Pain, or by Reaſon of any other Uneaſineſs, often ſcratched the Ground with his Feet: However he recover'd, and was well again.

Meadow Saffron.

He ſwallowed alſo five Roots of *Meadow Saffron* [*Colchicum Ephemerum*] dug freſh out of the Earth: With which he was violently tormented, but did not die.

Opium.

At laſt he took two Drachms of *Opium*, which caſt him into a deep Sleep; but after vomiting and voiding fœtid Excrements, he recovered by Degrees his former Briſkneſs. So many, and thoſe ſo notorious Poiſons could not kill this Dog.

Bite of a Viper.

Some Weeks after, when the ſame Dog had recovered his former Vigour, we tryed on him the force of a much ſtronger Poiſon. We cauſed him to be bit 3 or 4 times on the Belly, a little below the Navel, by an enraged Viper. There aroſe immediately little black Bladders containing a liquid blackiſh ſort of Corruption; they were flaccid and tremulous, like the Gall-Bladder when it is about half full; and a livid Colour by Degrees ſpread over all the neighbouring Parts. The Venom propagated itſelf with wonderful Quickneſs, and weakened all, but more eſpecially the Animal Functions; for notwithſtanding the Diaphragma did ſtill perform it's Office pretty ſtrongly, tho' with ſome Diſorder, and the Heart continued beating, tho' faintly and irregular; yet they ſeem'd to fare much better than the Brain, whoſe Strength was ſo weaken'd that it could not perform the Functions of Senſe and Motion but very faintly; inſomuch, that the Dog lay without any Strength or Senſation, as if he had been ſeized with a Lethargy or Apoplexy: Which kind of Stupidity we alſo obſerv'd, ſometimes in a greater, and ſometimes in a leſs Degree, in all other Dogs bit by a Viper. Being willing to ſave this Dog (tho' we had found by many Experiments, that much ſlighter Wounds made by a Viper had occaſioned Death) we thought fit to have recourſe to ſeveral Remedies; and therefore cupped and ſcarified the Part that was wounded, and applied Treacle [*Theriaca*]. After this we let him alone for about two Hours: But his Sleepineſs increaſing more and more, and his Vital and Animal Functions ſinking, we were forced to have recourſe to another Method of Cure. Wherefore to diſpel his Sleepineſs, we forced into his Throat half a Drachm of Volatile Salt of Hartſhorn mixt in Broth: which we eaſily did, by reaſon of his Weakneſs. In a little time after, his Eyes, which before looked dead, began to revive, and he was able to ſtand on his Feet and walk. Whereupon we repeated the ſame Doſe of the Volatile Salt, by which he was freed from his Sleepineſs, and the Strength of his Heart recover'd; and notwithſtanding he remained weak for three Days, yet he ſenſibly recover'd Strength, tho' he would eat nothing all that time: But he drank Water very plentifully and greedily; and on the ſecond Day he did not refuſe cold Broth. After the third Day he began to eat ſolid Meats, and ſeem'd now out of Danger; only ſome large foul

Ulcers remained on that Part of his Belly that was bit, of which h would ſcarce have died, had he not been kill'd by another Dog which prevented us from ſeeing the Event of this Experiment.

Bite of a Viper *in the* Tongue.

But to try more fully the Force of the above mentioned Poiſon, is neceſſary to make ſeveral Experiments of it: For tho' the Bite of Viper, if it be but ſlight, may kill ſome Dogs; yet in the Mont following, a large ſtrong Dog, that was bit in the Tongue, which a very dangerous Part, recovered without any Medicines. H Tongue indeed turned black, and ſwelled ſo much, that it could ſcar be contained in his Mouth: he was ſtupid, as is uſual from the V nom of a Viper, but not ſo much but that he could ſtand on his Fe A few Hours after, his Sleepineſs decreaſed; and the next Day endeavoured to lap Water, but the Bigneſs of his Tongue prevent him. On the third Day he threatned to bite any Body that diſturb him, and had recover'd ſo much Strength, as to be able to eſcape o of the Place where he was kept: and two Days after, was ſeen in t Streets; but what became of him afterwards we could not learn.

Root of Monks-Hood.

On the 17th of *October*, we gave a Dog 15 Grains of the dry Root of *Monks-Hood* [*Napellus*] powder'd, and mix'd with Fleſh an Broth. He had no ſooner taken it, but he was ſeized with a Difficu of ſwallowing, or rather ſeemed as if he was like to be ſtrangled. H immediately grew faint and reſtleſs, and dug the Ground with Feet; but ſoon deſiſted, by reaſon of a fainting Fit, as we imagine from the dull Colour of his Eyes, and a Weakneſs of all his Bod This Fainting was preſently ſucceeded by a violent Vomiting, which he threw up the Fleſh that he had eaten, which was very litt altered. His Fainting ſoon returning again, he laid himſelf on Ground; but being ſeized with terrible Convulſions of the *Abdome* Diaphragm, and of almoſt the whole Body, he run from Place Place, and vomited ſo great a Quantity of frothy Matter, that he w like to have been ſtrangled. His Vomiting increaſed, with a kin of crying and ſobbing, like broken Sighs, as if he had endeavour'd bark at thoſe that ſtood by. In this Manner he was miſerably tormen ed for the Space of an Hour; at which time all his Symptoms rem ted, and by Degrees he recovered,

In the Summer before, we gave a little Dog a Drachm of the Ro of *Monks-Hood* [*Napellus*]: He was ſoon after ſeized with the ſam Symptoms, but they were longer and more violent; and he in lik manner recovered.

In both theſe Dogs we particularly took Notice of theſe broken an interrupted Sighs, or kind of Sobbing; becauſe we did not obſerve t like to be occaſioned by any other Poiſon that we had made Trial o

Leaves, Flowers, and Seed of Monks-Hood.

An Ounce of the Leaves, Flowers, and Seed of the *Napellus* wh green, being bruiſed and given to a Dog, ſcarce diſordered him a more than if he eaten ſo much Graſs.

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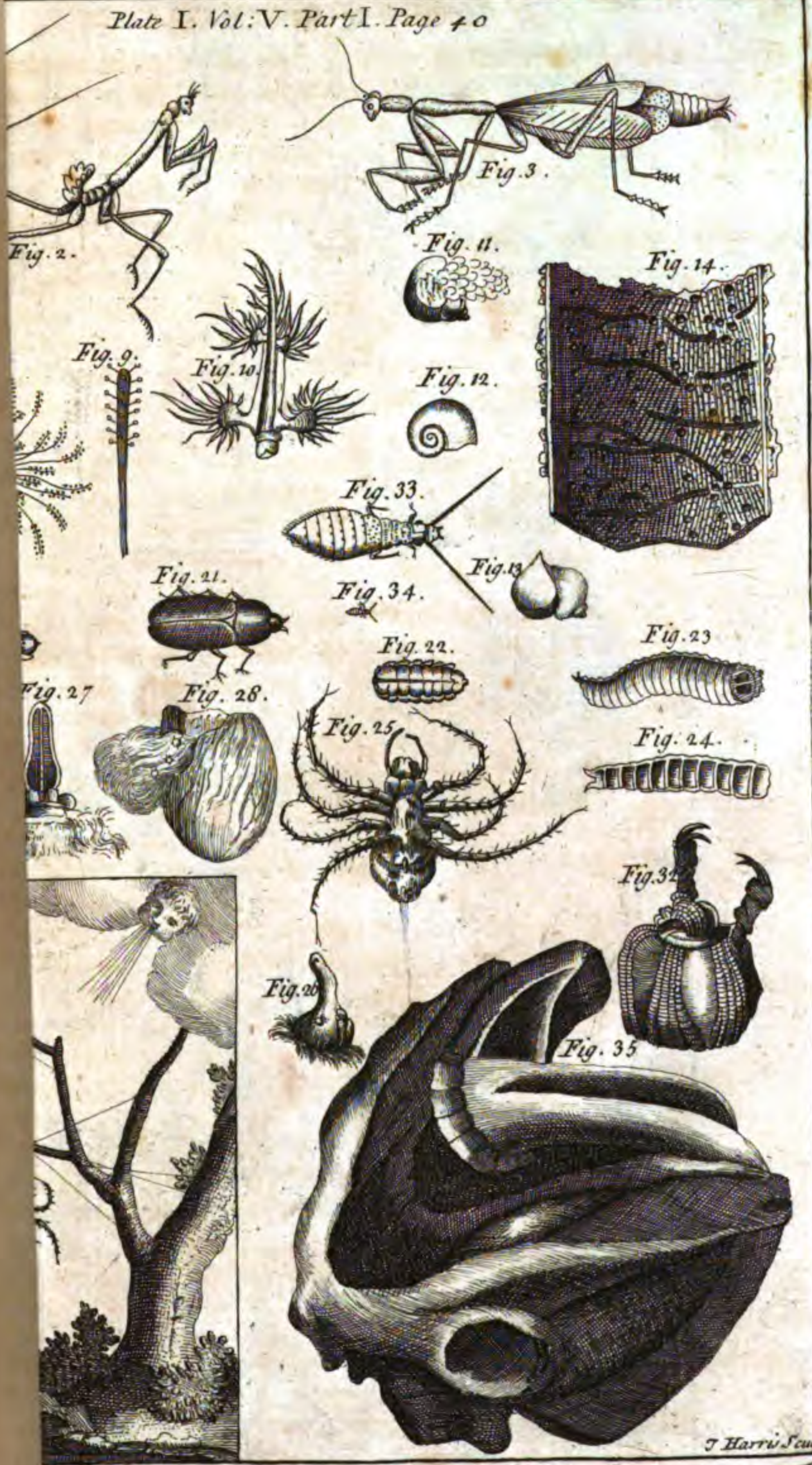
Fig. 2.
Fig. 3.
Fig. 11.
Fig. 14.
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Fig. 10.
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Fig. 13
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Fig. 34.
Fig. 22.
Fig. 23
Fig. 27
Fig. 28.
Fig. 25
Fig. 24.
Fig. 32
Fig. 26
Fig. 35
T Harris Sculp

Nux Vomica.

About the ſame time we made Tryal of the *Nux Vomica* on another Dog; not that we doubted of it's being a Poiſon, but that we might ſee the Effect of it on his Body when dead. The Dog accordingly dying in a ſhort time, we found his Stomach and ſmall Guts very red; and judged this Redneſs and Inflammation to be cauſed by the Corroſiveneſs of the Medicine.

Vinum Emeticum *injected.*

On the 20th of *October*, we injected warm into the Jugular Vein of a ſtrong luſty Dog an Ounce of Emetic Wine [*Vinum Emeticum*]. For a quarter of an Hour, after the Operation was over, and he was let looſe, he continued pretty well, unleſs that he ſeemed ſomewhat dejected; but afterwards he began to grow ill, and an unuſual Agitation was manifeſt about the Diaphragm; this was followed by a continual Vomiting, and a little after by an Evacuation of ſome hard Excrements. By theſe Evacuations he ſeemed to be ſomewhat relieved, but ſoon grew uneaſy, moved from Place to Place, and vomited again. After this he laid himſelf down on the Ground pretty quietly; but his Vomiting returning again, diſturbed his Reſt, and abated his Strength, which grew weaker and weaker; for in the Space of an Hour he vomited 12 times or more, and ſometimes voided ſome liquid Excrements but in ſmall Quantity; having frequent Inclinations to go Stool, but in vain, as in a *Teneſmus*. An Hour and a half after the Operation, he being ſo weak that he could not ſtand, his Eyes dull and looking as if he were half dead, we gave him ſome warm Broth thro' a Funnel. With this he was wonderfully refreſhed immediately, and ſoon after could look about, ſtand on his Legs and walk; but by reaſon of his Weakneſs reel'd as if he had been drunk. We left him by himſelf in a warm Room, where he remained cold, and lay as if he had been dying; and in an Hour after, we forced him to take ſome more Broth, which revived him again: But in a little time, after ſome Agitation of his Body, he vomited, made Urine very plentifully, howl'd miſerably and died convulſ'd. Next Day in viewing his *Viſcera*, we found two Things very obſervable (but neither of them occaſioned by the Liquor that was injected); one of them was in the Heart, the other in the *Œſophagus*. In the Heart there were two *Polypus*'s: That which poſſeſs'd the right Ventricle, ſtretch'd itſelf into the *Vena Cava*, and Pulmonary Artery; and that which was in the left Ventricle, ſent Branches into the adjoining Veſſels, and was leſs than that in the right Ventricle. The Subſtance of the *Polypus* was pretty firm, of a fleſh Colour, ſomewhat pellucid, and being cut thro' the middle, was altogether of the ſame Colour and Conſiſtence as on the Surface. To the *Œſophagus* there grew a remarkable Gland, which was hard, callous, and foul, and opened with a ſmall, round, fleſhy Orifice, into the Inſide of the Stomach, where, upon preſſing it, a little Corruption came forth. Upon opening this Gland, or Tubercle, we found in it a great many little Worms wrapt and entangled together, and moiſten'd with a corrupted Matter. Some of theſe Worms were above four Inches long, others leſs. Afterwards we found the like Glands full of Worms, in other Dogs, and in moſt we opened, but not ſo much corrupted as in this. We obſerv'd alſo the like foul Glands in the *Aorta deſcendens*, but in one only found a Worm like theſe, which was almoſt got out of it, thro' an Orifice, into the Cavity of the *Thorax*. After this we likewiſe obſerved more *Polypus*'s in Dogs.

Sal Armoniac *injected.*

On the 27th of *October*, we injected warm into the Jugular Vein of a Dog, a Drachm and a half of *Sal Armoniac*, diſſolved in an Ounce and half of Water. The Liquor had ſcarce arrived at the Heart, but the Dog preſently fell into dreadful Convulſions over his whole Body; Wherefore we let him looſe, but he dyed immediately.

Bite of a Blind Worm.

On the 18th of *November*, we cauſed a Whelp to be bit in the lower Lip by a blind Worm [*Cæcilia*], ſo that the blood appeared in the Wound. The Whelp dy'd indeed the ſame Day; but becauſe we had committed him to the Care of another Perſon, we could not be certain whether he dy'd of the Wound or not; and what increaſed our Suſpicion, was, that there did not appear on the Part that was bit, any livid Colour.

Salt of Tartar *injected.*

On the 12th of *December*, we injected into the Jugular Vein of a Dog a Drachm of *Salt of Tartar* diſſolved in an Ounce of warm Water: He dy'd crying, and in Convulſions, almoſt immediately.

On the 15th of *December*, we found a *Polypus* in both the Ventricles of the Heart of a Dog, each *Polypus* ſtretching itſelf with a double Root into the Veſſels of the Ventricle it poſſeſſed. Afterwards we often obſerved the like *Polypus*'s in other Dogs.

Urine *injected.*

On the 20th of *December*, we injected warm into the Jugular Vein of a Dog, an Ounce of Urine made by a Man faſting. The Dog was uneaſy during the Injection, and while the Liquor paſſed to the Heart; but was not ſeized with any Convulſions or other ill Symptoms; and being let looſe, eat Bread very greedily.

Decoction of White Hellebore *injected.*

The ſame Day we made a gentle Decoction of two Drachms of *White Hellebore*, well powder'd, in Spring Water, and evaporated it away to nine Drachms and a half: and the next day injected all the Decoction, ſtrongly preſſed out and turbid, into the Jugular Vein of a Dog. At firſt ſome few Drops only paſſed to the Heart, ſome concreted Blood obſtructing the Paſſage; but thoſe Drops very much affected the Dog, for he was ſeized immediately with convulſive Motions: but ſoon after, when the Liquor had removed what lay in it's way, and had enter'd the Heart, it killed the Dog as ſuddenly as if he had been ſhot thro' the Heart with a Bullet; for having looſened him preſently, to ſee if any Life remain'd, he was quite dead and flaccid, and hung like a Fleece in the Hand of the Perſon that held him.

Vinegar *injected.*

On the 2d of *January*, 1679, *Vinegar* was injected warm into the Jugular Vein of a Dog, without doing him any manifeſt Harm.

Sting of Scorpions.

The ſame Day we cauſed a *Whelp* to be ſtung in the Tongue by ſeveral *Scorpions*; but the Wounds made by the *Scorpions*, by reaſon of their Weakneſs, being but ſlight, and not penetrating deep, we made a ſmall Inciſion on the *Abdomen*, and drawing aſide the Skin, let the *Scorpions* make ſeveral Wounds on it; but without any Effect, tho' we often forced the Sting into the Wounds, and preſſed the Bladder that is ſuppoſed to contain the Venom.

In like manner a *Pigeon* being ſeveral times ſtung by a *Scorpion*, remained unhurt,

Sugar *injected.*

January the 3d, two Drachms of *Sugar* diſſolved in one Ounce of Water, was injected into the Jugular Vein of a Dog: he received no harm from the Injection, but continued well for the three Days after that we kept him.

Spirit of Salt *injected.*

On the 4th of *January*, a Drachm and half of *Spirit of Salt*, diluted in an Ounce and half of Water, and injected into the Jugular Vein of a Dog, killed him immediately. In the right Ventricle of his Heart, we found the Blood partly grumous and concreted into harder Clots than ordinary, and partly frothy. In the ſame Dog that Gland that contains Worms, and is frequently found in the *Œſophagus*, opened with two Orifices into the Cavity of that Part, and in the *Sinus* of it there lay ſeveral ſmall Worms.

Caterpillars of the Pine-Tree.

January the 5th, we gave a Dog 12 ſmall Caterpillars of the Pine-Tree [*Pityocampe, vel Erucæ Pini*] weighing half a Drachm, which we bruiſed alive and mixed with Fleſh. The Dog, tho' he was but young, received no other hurt, than that now and then he ſeemed as if he endeavoured to ſwallow ſomething, or was troubled with an Inclination to vomit; from whence we judged the Stomach and *Œſophagus* to be only lightly affected: but theſe Symptoms vaniſhed in a few Hours. and the Dog continued briſk, and greedy of Meat all the reſt of the Day.

A Scorpion *devoured by a* Rat.

The ſame Day we included a Rat in a large Glaſs with a *Scorpion*; but the *Scorpion* being dull, and benumb'd with the extream Coldneſs of the Weather, was able to wound the Rat but very weakly; with which however the Rat being provok'd, ſet upon the Scorpion, and gnawed off and devoured part of him keeping his Eyes ſhut all the while, that he might not be hurt by his Claws or Sting. The ſame Fate happened to another Scorpion, which we added to the former, but the Rat notwithſtanding remained unhurt.

Spirit of Wine *with* Camphire *injected*

January the 6th, we killed a Dog almoſt in a Moment, by injecting into his Jugular Vein an Ounce of *Spirit of Wine*, in which there was diſſolv'd a Drachm of *Camphire*.

Opium *injected.*

The ſame Day we injected warm into the Crural Vein of a Cat, 50 Grains of *Opium*, diſſolved in an Ounce of Water. The Cat preſently after the Injection ſeemed very much dejected, but did not cry: only made a low, interrupted, complaining Noiſe. After this followed Tremblings of her Limbs, convulſive motions of her Eyes, Ears, Lips. and almoſt all Parts of her Body, with violent Convulſions of her Breaſt; ſometimes ſhe would raiſe her Head, and ſeem to look about her, but her Eyes were very dull and deadiſh; and tho' ſhe was let looſe, and had nothing tied about her Head or Neck, yet her Mouth was ſo filled with Foam or Froth, that ſhe was like to be ſtrangled. At laſt, her convulſive Motions continuing, and being ſeized with a ſtretching of her Limbs, ſhe dy'd within a Quarter of an Hour. Upon opening her Body, we did not find the Blood much alter'd from it's natural State.

February the 7th, we injected into the Crural Vein of a luſty Dog, a Drachm and half of *Opium*, diſſolved in an Ounce and half of Water. The Dog immediately ſhewed the great Pain he endured, by a violent ſtruggling of his whole Body, a loud Noiſe that he made, notwithſtanding his Jaws were tied, a great Difficulty of Breathing and Palpitation of the Heart, with convulſive Motions of almoſt all Parts of his Body: In a little time all theſe remitted, and he was ſeized with a profound Sleep, as if he had been in a Lethargy or Apoplexy. Having let him looſe, he lay upon the Ground without moving or making a Noiſe, in ſo deep a Sleep, that he would not move with beating. About half an Hour after, if we beat him, he would move a little, but preſently lay down again. After an Hour, if we beat him, he would move a little more; and by degrees his Sleepineſs a little decreaſing, in an Hour and half, or two Hours time, when he was beat, he would make a Noiſe, and walk a little, but ſeemed very heavy and ſtupified, and reeled as he went; but as ſoon as we left off beating him, as if he had forgot every thing that had paſſed, he preſently laid himſelf down again, and fell aſleep. Next Day when we viewed the Place where he lay, we found a great Quantity of fœtid Excrements, like corrupted Blood, or the diluted Opium that had been taken: But ſtill his Drowſineſs continued, and tho' we beat him with Whips, that he run crying about the Room, yet he preſently forgot it, and immediatly fell aſleep again. In this ſleepy Condition he continued three Days, refuſing whatſoever was offered him to eat, or rather not minding that or any thing elſe. On the fourth Day we found him dead: But perhaps he would not have dy'd of the ſtupifying Quality of the *Opium*, if (conſidering the extream Coldneſs of the Weather) we had put him in a warmer Place, and had forced him to have taken ſome Broth.

February the 8th, we found in the Bladder of a *Tortoiſe* adhering to it's Coat, a flat porous *Stone*, about twice as big as a Lentil.

Salt *injected.* *February* the 9th, a Drachm and half of *Common-Salt*, diſſolved in an Ounce and half of Water, was injected into the *Jugular Vein* of a Dog. After the Injection, he was thirſty, and drank Water greedily; but in other Reſpects he ſeemed to be pretty well, and the next Day was quite recovered.

Oil of Olives *injected.* *February* the 20th 1679, we injected into the Crural Vein of a little Dog, half an Ounce of warm *Oil of Olives*, which we did with a great deal of Difficulty, and very ſlowly, by reaſon of the ſmallneſs of the Vein and Thickneſs of the Liquor. For half a Quarter of an Hour that we were injecting the Liquor, the Dog did not ſeem to be uneaſy or out of Order; but after that, he barked, cried, looked dejected, and fell preſently into a deep Apoplexy, ſo that his Limbs were depriv'd of Senſe and Motion, and were flexible any way at pleaſure; his Reſpiration ſtill continuing very ſtrong, with a Snorting and Wheezing, and a thick, watry Humour flowing in great Quantity out of his Mouth, which was ſometimes mixt with Blood. He loſt all external Senſe; his Eyes, tho' they continued open, were not ſenſible of any Objects that were put to them; and we touched and rubbed the *Cornea* (as ſenſible a Part as it is) without any more Sign of his being ſenſible of it, than if he had been dead. His Eyelids notwithſtanding had a convulſive Motion; his Hearing was quite loſt; and his Feeling, tho' at firſt he ſeemed to have ſome ſmall Senſe of it when we touched his Wound, yet afterwards it was ſo dull, that we pinched his Claws and Fleſh with Pinchers, and bored Holes thro' his Ears, without his moving or ſeeming to be the leaſt ſenſible of it. It is worth obſerving, that in the midſt of his Sleep, being ſometimes ſeized with a convulſive Motion of his Diaphragm and other Muſcles that help Reſpiration, he would bark ſtrongly as if he were awake, and in a little time would be quiet again: ſo that in leſs than a Quarter of an Hour his Reſt would be diſturbed three or four times with this violent Barking. And conſidering this more attentively, we found that at the very time he barked, he was as void of Senſe as before; for we could neither make him bark nor leave off barking, by either beating or pricking him; but in a little time would leave off of himſelf, and return to it again ſome time after. Thus in three Hours after the Injection, ſpent in Sleeping and Barking, he dy'd; and having opened his Body after he was dead, we found the *Bronchia* of the Lungs filled with a thick Froth.

A few Days after we injected a large Quantity, *viz.* an Ounce, of *Oil of Olives* into the Jugular Vein of a Dog, which ſuffocated him the ſame Moment.

Afterwards the ſame Quantity of *Oil of Olives*, being injected into the Jugular Vein of a Dog, killed him in an Hour's time. He was ſeized with a great Sleepineſs, Snorting and Wheezing, and a bloody Water run plentifully out of his Mouth. In this Dog, tho' he did not die immediately, we did not obſerve the Barking as in the former: But in all that were ſuffocated by Oil, we found their Lungs filled with a very thick Froth.

February the 27th, we injected 10 Drachms of highly rectified *Spirit of Wine* into the Crural Vein of a Dog. The Dog died in a very little time, very quietly, and as it were with Pleaſure, licking his Jaws with his Tongue, and breathing quick, but eaſily, without barking, crying, or any convulſive Motion. In the *Vena Cava* and right Ventricle of the Heart, the Blood was concreted into a great many liquid hard Clots; which appeared yet more conſpicuous and harder in ſome

Spirit of Wine *rectified injected.*

Blood that flowed back from the Vein into the Syringe. In this Dog we found the Emulgent Artery of the Left Side to be double.

March the 2d, we injected three Drachms of rectified *Spirit of Vine* into the Crural Vein of a ſmall Dog; which made him Apoplectic, and as if he were half dead. In a little time he recovered from his Apoplexy, but grew giddy; and when he endeavoured to go, reeled and fell down. Tho' his Strength increaſed by Degrees, yet his Drunkenneſs ſtill continued: His Eyes were red and fiery, and his Sight ſo dull, that he did not ſeem to take notice of any thing, and when he was beat, would ſcarce move. However, in four Hours time he grew better, and would eat Bread when we gave it him. The next Day he was briſker, and ſeemed paſt all Danger.

In diſſecting the ſame Dog ſome time after, we found in the ſmall Guts two *Flat-Worms*; one of them about ſix Spans long, and the other about five. They had perforated the Gut: and one of them was got half out of it into the Cavity of the *Abdomen.*

About the ſame time we found in two Dogs a Worm of near a Foot in Length, out of the Inteſtines, in the Cavity of the *Abdomen*, the Inteſtines being no ways perforated, but remaining ſound and whole. That we might be more certain of this, we ſeparated them from the Meſentery, and viewed them very carefully. But in both theſe Dogs the *Omentum* was of an ill Colour, and putrefied; from whence we conjectured, that theſe Worms were bred from the Putrefaction of the *Omentum.*

White Wine *injected.*

We injected into the Crural Vein of a Dog five Ounces of a ſtrong *White Wine*; which made him very drunk, and little different from what a leſs Quantity of *Spirit of Wine* would have done: But in a few Hours his Drunkenneſs abated, and he recovered.

Decoction of Tobacco *injected.*

In the ſame Month of *March*, we injected into the Crural Vein of Dog, an Ounce of a ſtrong Decocton of *Tobacco.* He was ſeized immediately with ſtrange Convulſions of his whole Body. At firſt his Eyes look'd wild and diſtorted, his Jaws trembled, and in a litle time he dy'd terribly convuls'd. This Experiment we repeated ſeveral times after, and always with the ſame Succeſs.

Oil of Sage *with* Sugar *injected.*

Ten Drops of diſtill'd *Oil of Sage*, mix'd with half a Drachm of Sugar, and diſſolv'd in an Ounce of Water, being injected into the Crural Vein of a Dog, did him no harm.

In a *Caſtrated* Dog we obſerved the *Peritonæum* and Spermatick Veſſels to be covered with Fat, and ſcarce to be ſeen; and that he did not ſmell ſo rank and ſtrong as other Dogs that had not been caſtrated.

A yellow ſtreak'd *Lizard* [*Lacerta Chalcidica*] which had been kept all the Winter in a Glaſs with Bran, being expoſed to the Sun to refreſh it, on the contrary died in a few Hours. We have alſo often found, that Scorpions expoſed to the hot Sun, eſpecially in the Summer, died in a ſhort time.

A Drachm

Vitriol *injected.*

A Drachm of purified *White Vitriol*, injected into the Crural Vein of a Dog, killed him immediately.

Salt *of* Urine *injected.*

Fifteen Grains of *Salt of Urine*, diſſolv'd in an Ounce of Water, and injected into the Crural Vein of a Dog, caſt him into ſuch violent Convulſions, that we were afraid he would die under them. When he had recovered himſelf a little, we repeated the Injection with the ſame Quantity; but the Dog got the better of it, tho' with a great deal of Difficulty, and perfectly recovered.

Decoction of Senna *injected.*

April the 27th, we made a Decoction of two Drachms of *Senna* in Water, and injected warm three Ounces of it into the Crural Vein of a very fat, large, and ſtrong Dog. He continued pretty quiet, without any Sign of Pain or Uneaſineſs, during the Operation; and when it was over, we let him looſe, expecting the Event of it. He was melancholy and dejected, but eaſy and without ſenſible Commotion for the ſpace of an Hour. After that, his Reſpiration grew quicker, he had a murmuring Noiſe in his Belly, with violent Commotions of the Muſcles of his *Abdomen*, Diaphragm, Stomach and Inteſtines, and vomited plentifully a Bilioſe Matter. After his Vomiting he grew faint, and in a little time his Vomiting returned again; ſo that in an Hour and half he vomited four times. His Strength and Appetite were very weak, and he would eat nothing for three Days. But on the third Day his Appetite, Strength, and former Briſkneſs returned, and he recover'd.

The Recurrent Nerves *of a* Dog *cut.*

Two Dogs, which had their *Recurrent Nerves* cut, loſt their Barking and Voice. But doubting whether the Wound or Scar might not affect and Hurt the Motion of the Muſcles, we performed the ſame Operation on another Dog, but without cutting the Nerves; and when the Wound was healed, he barked as freely as before.

Nerves of the Par Vagum *cut.*

A Dog that had the Nerves of the *Par Vagum* cut aſunder, preſently grew dejected and faint. He breathed very ſlowly, and with Sighs; for when he had drawn in his Breath leiſurely and inſenſibly, it came forth again immediately very forcibly, and with a Sigh, as if it had been retained a long time in the Lungs. The Muſcles of the *Abdomen* and the Diaphragm laboured hard, as if they were to ſupply the Defects of the Lungs, which were grown almoſt uſeleſs by being denied an Influx of Spirits by the Pneumonic Nerves. The Dog refuſed all kind of Meat; ſometimes he vomited, or had an Inclination to vomit; and at laſt, in two Days time, he died.

Another Dog, that had the Nerves of the *Par Vagum* only tied, lived en Days. He vomited frequently, and would not eat, unleſs clanſtinely: He breathed with Sighs, and was very faint.

Ligature on the Aorta.

A Dog that had the Trunk of the *Aorta deſcendens* tied hard a little above the Diaphragm, immediately loſt the Uſe of his hind Legs; for when he ſtood on his four Legs, he would draw after him his hinder Legs, as if they had been dead: he grew weaker by Degrees, and died in five Hours.

July

A Mole *Stung by a* Scorpion.

July the 12th, a *Mole* being ſtung in the Side by a *Scorpion*, died immediately convulſed. In this we obſerved, that the *Inteſtinum Cæcum* is wanting in Moles.

An Account of the Contagious *Diſeaſe amongſt the* Cows, 1714. *Communicated by Mr.* T. Bates. n. 358. *p.* 872.

XVI. A Contagious Diſeaſe appear'd amongſt the *Milch Cows*, about the middle of *July* 1714, at *Iſlington*; whereupon the *Lords Juſtices* order'd me to enquire into the Truth of the Report of it's being Contagious; Four *Juſtices* of the *Peace* were alſo appointed to make the neceſſary Examinations.

We went to *Iſlington*, and found that Mr *Ratcliff* had loſt 120 out of 200; Mr *Rufford* 62 out of 72, and Mr *Pullen* 98 out of 87. They were very unwilling to own it, becauſe ſo ſoon as it ſhould be known, none would buy their Milk: but Mr *Ratcliff* at length gave us the following Account; *Viz.*

That at firſt the Cows refuſed their Food: the next Day had huſkiſh Coughs, and voided Excrements like Clay; the Heads ſwelled, and ſometimes their Bodies. In a Day or two more, there was a great Diſcharge of a Mucous Matter by the Noſe, and their Breaths ſmelled offenſively. Laſtly, a ſevere Purging (ſometimes Bloody) which terminated in Death. That ſome died in three Days, and others in five or ſix, but the Bulls lived eight or ten. That during the whole Illneſs they refuſed all manner of Food, and were very hot.

We then adviſed with ſeveral of the *Cow-leeches*, or Doctors, who all agreed that it was a Murrain, or rather a Plague; and that the Methods they had tried for a Cure, had proved unſucceſsful.

We then ordered ſome of the ſick Cows to be Houſed, and ſeveral ſorts of Cattle to be kept with them, to ſee whether the Contagion would affect any other Species.

The next Day I made a Report to their Excellencies, and afterwards by their Order, drew up the following Propoſals.

1. That all ſuch Cows as are now in the Poſſeſſion of Mr *Ratcliff*, *Rufford*, and *Pullen*, be Bought, Kill'd and Burnt: or, at leaſt, that the Sick be burnt; and the Well kept and ſecured on the Grounds where they now are; that ſuch of them as Sicken or Die of this Diſtemper may be burnt.

2. That the Houſes in which thoſe Sick Cows have ſtood, be waſhed very clean, and then ſmoaked by the burning of Pitch, Tar, and Wormwood, and be kept three Months at leaſt, before any other Cows are put therein.

3. That the Fields where thoſe Sick Cows have grazed, be kept two Months before any other Cows are ſuffered to ſtand or graze thereon.

4. That the Perſons looking after ſuch as are ill, ſhould have no Communication with thoſe that are well.

5. That the ſame Methods be obſerved if any one of the Cow-keepers ſhould get this Diſtemper amongſt them; and that as ſoon as they perceive any of their Cows to refuſe their Meat, or have any

others

other Symptoms of this Diſtemper, that they immediately ſeparate them from their others, that they may be burnt; and the Places where they have ſtood or grazed, to be ordered as before.

6. That the Cow-keepers be required to divide their Cows into ſmall Parcels, not more than ten or twelve in a Field together.

The next Day their Excellencies conſulted the four Gentlemen, and gave them Orders to comply with the preceding Propoſals, and to allow *Forty Shillings* for every ſick Cow which they burnt, that belonged to Mr *Ratcliff*, *Rufford*, and *Pullen*; but the free Intercourſe which both Maſters and Servants had had with each others Cows (before we were appointed) had ſpread the Contagion; and the Diſeaſe began ſoon to appear in ſeveral other neighbouring Places.

The Gentlemen then ſummoned all the Cow-keepers in the County, and acquainted them with the above-named Propoſals, and offered them *Forty Shillings* for every Cow which they burnt, that had not been ſick above twenty-four Hours; but for ſuch as had been longer ill, or were dead, they would allow them only the Value of their Skins and Horns.

A great Obſtacle at the firſt was the Cow-keepers not owning the Diſeaſe, till they had loſt ſeveral of their Cows; for ſo ſoon as it was known that any Man had but one ſick, none would buy his Milk; and to thoſe who kept many Cows, that Loſs was conſiderable.

Nor was there ever wanting one or other who gave them Hopes of a Cure.

I diſcourſed the *Cow-leeches* about the Cuſtoms and Diſeaſes that Cows were ſubject to, and conſulted ſuch Books as treated of them; but concerning this Diſeaſe, I could gain but ſmall Aſſiſtance from either.

I then made Diſſections of ſixteen Cows, in different Degrees of Infection; and found the Putrefaction of their *Viſcera* to increaſe in proportion to the Time of their Illneſs.

The firſt five that I opened, had herded with thoſe that were ill, and the Symptoms of this Diſtemper were juſt become viſible; in theſe the Gall-bladders were larger than uſual, and filled with Bile of a natural Taſte and Smell, but of greener Colour. The *Pancreas*'s were ſhrivelled, ſome of the Glands obſtructed and tumified. Many of the Glands in their *Meſenteries* were twice or thrice their natural Bigneſs. Their Lungs were a little inflamed, and their Fleſh felt hot. All other Parts of their *Viſcera* appeared as in a healthful State.

The next ſix that I opened, had been ill about two Days; in them the Livers were blacker than uſual, and in two of them, there were ſeveral Cyſts filled with a petrified Subſtance like Chalk, about the Bigneſs of a Pea. Their Gall-bladders were twice their uſual Bigneſs, and filled with Bile of a natural Taſte and Smell, but of a greener Colour than the firſt. Their *Pancreas*'s were ſhrivelled, ſome of their Glands very large and hard, and of a blackiſh Colour. The Glands in their *Meſenteries* were many of them five times their natural Bigneſs, and of a blackiſh

Colour. Their Lungs were inflamed, with ſeveral ſmall Cyſts forming. Their Inteſtines were full of red and black Spots. Their Fleſh was very hot, tho' not altered in Colour.

The five laſt that I opened, were very near dying; in them I found the Liver to be blackiſh, much ſhrivelled and contracted, and in three of them there were ſeveral Cyſts as big as Nuts or Nutmegs, filled with a petrified Subſtance like Chalk. Their Gall-bladders were about three times their uſual Bigneſs, and filled with Bile of a natural Taſte and Smell, but of a deep green Colour. Their *Pancreas*'s were ſhrivelled and contracted, many of their Glands very large and hard, and of a black Colour. The Glands in their *Meſenteries* were many of them diſtended to eight or ten times their natural Bigneſs, were very black, and in the *Pelvis* of moſt of thoſe Glands in two Cows, there was a yellow Petrefaction, of the Conſiſtence of a ſandy Stone. Their Inteſtines were the Colour of a Snake, their inner Coat excoriated by Purging. Their Lungs were much inflamed, with ſeveral Cyſts containing a yellow purulent Matter, many of them as big as a Nutmeg. Their Fleſh was extream hot, tho' very little altered in Colour.

I have here only given a general Account of my Diſſections, in the three different Stages of the Diſeaſe; for as the Difference was but ſmall, and the Diſeaſe incurable, it is needleſs to give each particular Diſſection at large; but the following Caſes being very extraordinary, I cou'd not omit the mention of them, *viz.* In one of them the Bile was petrified in it's Veſſels, and reſembled a Tree of Coral, but of a dark yellow Colour, and brittle Subſtance.

In another there were ſeveral Inflammations on the Liver, ſome as large as a Half-Crown crack'd round the Edges, and appeared ſeparating from the ſound Part, like a Peſtilential Carbuncle.

In a third, the Liquor contained in the *Pericardium*, (for lubricating the Heart in it's Motion) appear'd like the Subſidings of *Aqua Calcis*; and had excoriated, and given as yellow a Colour to the whole Surface of the Heart and *Pericardium*, as *Aqua Calcis* could poſſibly have done.

In giving my Opinion of this Diſtemper, I muſt beg leave to premiſe, that all Cows have naturally a Purgation by the *Anus* for five or ſix Weeks in the Spring, from (as Cow-keepers term it) the *Firmneſs* of the Graſs; during which Time they are briſk and lively, their Milk becomes thinner, and of a bluiſh Colour, ſweeter to the Taſte, and in greater Plenty: But the Spring preceding this Diſtemper, was all over *Europe* ſo dry, that the like has not been known in the Memory of any one living; the Conſequence of which was little Graſs, and that ſo dry, and void of that *Firmneſs* which it has in other Years, that I could not hear of one Cow-keeper, who had obſerved his Cows to have that Purgation in the ſame degree as uſual; and very few who had obſerved any at all. They all agreed that their Cows had not given above half ſo much Milk that Summer as they did in others;

that ſome of them were almoſt dry; that the milk they did give was much thicker and yellower than in other Years. It was obſerved by the whole Town, that very little of the Milk they ſold would boil without turning; and it is a known Truth, that the weakeſt of the common Purges you can give a Cow, entirely takes away her Milk: From all which Circumſtances, I think it evident, that the Want of that natural Purgation was the ſole Cauſe of this Diſeaſe; by producing thoſe Obſtructions which terminated in a Putrefaction, and made this Diſtemper contagious: Many more Circumſtances of leſs moment occurr'd, to confirm me in this Opinion.

Cows are likewiſe ſubject to a Purgation (though in a leſs degree) from the ſame Quality in the Graſs, about the later End of *September*, which is called the latter Spring; and which I believe contributed not a little to the preventing the Increaſe of the Diſtemper; for this Purgation coming ſo ſoon after the Diſeaſe appeared, it is not unreaſonable to ſuppoſe, that it freed ſuch Cows as were not much injured, from the ill Effects of thoſe Obſtuctions, occaſioned by the Want of their Vernal Evacuations.

Several Phyſicians attempted the Cure, and made many Eſſays for that Purpoſe; but the Diſſections convinced me of the Improbability of their ſucceeding. However, they having received the following *Recipe* and Directions from ſome in *Holland*, ſaid to have been uſed there with good Succeſs, gave me Orders to make Trial of it; but in very many Inſtances I was not ſenſible of the leaſt Benefit.

℞ *Herb. Ariſtoloch. Rotundæ*, *Veronicæ*, ana M. viij. *Pulmonariæ*, *Hyſſopi*, *Scordij*, ana M. iv. *Rad. Gentianæ*, *Angelicæ*, *Petaſitidis*, *Tormentillæ*, *Carlinæ*, ana ℔ ſs. *Bac. Lauri*, *Juniperi*, ana ℥xij. *Miſce fiat Pulv.*

This Powder is to be given in Water, one Ounce at a time, three or four Mornings ſucceſſively; then reſt four Days, and if the Diſeaſe continues, repeat the Powders in warm Water, as before.

I think there is no one Method in Practice, but what was tryed on this Occaſion, tho' I cannot ſay that any of them was attended with an Appearance of Succeſs, except that of bleeding plentifully, and giving great Quantities of cooling and diluting Liquids. But by this Method the Inſtances of Succeſs were ſo few, that they do not deſerve any further mention.

Their Excellencies being informed that the feeding Cows with Diſtillers Grains, was a new Cuſtom, and was the Cauſe of this Diſeaſe, gave me Orders to examine into the Truth of it; but upon Enquiry, I found it to have been the Practice of ſeveral of the Cow-keepers above twenty Years, without the leaſt Appearance of any Inconvenience; and that ſome of thoſe Perſons who had ſuffered moſt, had never given any. Nor is there any Difference between thoſe of Brewers and Diſtillers, only that the latter are the drier.

It was likewiſe ſaid, that the Want of Water was the Cauſe of this Diſeaſe, for the Springs and Places where the People uſed to water their Cows, were almoſt every where dry; and that many were oblig'd to ſend them ſeveral Miles for Water. This might produce ſome Diſeaſes, but ſuch only as they got by the Fatigue of being driven ſo far; for Mr *Ratcliff*, Mr *Rufford*, and Mr *Pullen*, the three Perſons where this Diſeaſe firſt appear'd, had the New River Water running thro' the very Grounds where their Cows conſtantly grazed, and could drink at their pleaſure, and ſo had moſt of the Cow-keepers at *Iſlington*.

About the later End of *September*, the Diſeaſe increaſed, and the Numbers brought to be burnt were ſo great, that it could not be well executed; therefore it was judged proper to bury them fifteen or twenty foot deep; but firſt to make large Inciſions in their moſt fleſhy Parts, and to cover them with Quicklime.

At the ſame time, having notice that it was a Cuſtom with the Cow-keepers, to ſend their Calves when a Week old to *Rumford*, &c. to be ſold; and apprehending by this means that the Contagion might be carried into the Country, I required all ſuch as had ſick Cows, to bring their Calves to be buried; to which they readily conſented, and were allow'd from *Five* to *Ten Shillings per Calf.*

In the Beginning of *October*, being informed that ſome of the Cows in *Norfolk*, *Suffolk*, and *Hertfordſhire*, had got this Diſeaſe, and apprehending that it would become general; I gave in the following Report to a Committee of Council.

The Diſtemper among the Cattle increaſing, and beginning to appear in ſeveral other Counties, I thought it my Duty to acquaint your Lordſhips with the Hazard that may attend their not being duly buried. It is the Opinion of all Authors in Phyſick, that treat of Contagious Diſeaſes, as well as of ſeveral of the Phyſicians in Town, that a Putrefaction of ſo many Cows as there is reaſon to fear will die of this Diſtemper, may produce ſome contagious Diſeaſe among Men; unleſs they are buried ſo deep, that the infectious *Effluvia* cannot injure the Air, which I am certain has very ſeldom been complied with, except in the Counties of *Middleſex*, *Eſſex*, and *Surry*. It is affirmed by ſeveral now living, that there was a Mortality among the Cattle, a little before the laſt great Plague in the Year 1665. which was imputed to the want of a due Care in burying them. And it appears of what Importance it was judged by the King of *Pruſſia*, the States of *Holland*, and ſeveral other Princes and States, by the Care they took to publiſh Decrees and Placarts, commanding them to buried upon Pain of Death, or other ſevere Penalties; and I conceive it would be neceſſary, not only to bury thoſe which ſhall die, but that ſuch as are already dead, may have the ſame Care; as alſo that they be buried nine or ten Foot deep at leaſt.

Theſe Regulations were not put in execution, for within three Weeks or a Month after, the following Particulars concurred to put an End to the Diſeaſe.

The Cows began their latter Purging, which contributed much to prevent the Diſeaſe from appearing in freſh Places; and the Cow-keepers were convinced that the Diſeaſe was incurable.

The Knowledge of the Diſeaſe was ſpread all over *England*, ſo that none wou'd buy a Cow in the Country; and the Gentlemen prevented their being kill'd in Town, by having the Markets examined daily; and ſuch Meat condemned as appeared ſuſpicious.

They now divided their Cows into ſmall Parcels, by which they loſt only that in which the Diſeaſe happen'd; whereas before that Method, when one Cow got this Diſeaſe, if ſhe had herded with One, Two, or Three Hundred (the Contagion was ſuch) ſcarce one did eſcape.

Thoſe who had no ſick Cows avoided all Communication with ſuch as had.

They likewiſe found that the keeping their Cows ſo long when ill, had been the chief Cauſe of their Loſs; they therefore now brought them to be buried on the firſt Appearance of the Diſeaſe, before the Contagion cou'd poſſible have got to any great Height.

The Severity of this Diſeaſe in *England* did not laſt above three Months; tho' it was not entirely ſuppreſſed till about *Chriſtmas*: But in ſeveral other Countries it continued two or three Years; and I am credibly aſſured, that in *Holland* it now rages with as much Violence as ever; that they have loſt in Cows, Oxen, and Bulls, above three hundred Thouſand.

The Providence of God has ſo diſpoſed the Matter of Animal Bodies, as to render contagious Diſeaſes very ſeldom infectious to different Species, but Experience demonſtrates, that Contagions may be communicated to the ſame Species, by touching the Woollen, Linnen, *&c.* to which the infectious *Effluvia* of the Diſeaſed had adhered, tho' the two Bodies ſhould be at a very great diſtance; and I verily believe, that more Hundreds died from the Infection which was carried by the Intercourſe that the Cow-keepers had with each other, than ſingle ones by the original Putrefaction.

The Number of Bulls and Cows loſt by this Diſeaſe, in the Counties of *Middleſex*, *Eſſex*, and *Surry*, were Five Thouſand Four Hundred d Eighteen; and of Calves, Four Hundred and Thirty Nine.

VII. In cutting the Stomach or Gizzard of a Fowl, I found ſome- ing reſiſted my Knife; upon examining it farther, I diſcover'd it to e a Pin, which the Pullet had ſwallowed, and in all Probability had ain in her ſome time: For it had pierced thro' the Membrane on the nſide, and made a Paſſage into the thick Part, where it had form'd tſelf a Bed. It is obſervable, that the Head of the Pin had paſt thro' the

A Pin *in the* Gizzard *of a Fowl, by Mr* N. Regnart. n. 301. *p.* 2055.

the firſt ſhrivell'd Membrane, but ſtopt at the ſecond, which ſeem'd more thick and nervous; ſo that the Head remained incloſed between the two Membranes, the Body of it having made it's way into the fleſhy muſcular Part. At the Point there was form'd a *Callus*, of the Bigneſs of a ſmall Pea, which ſeem'd a Defence, that Nature had made to oppoſe it, as it was working itſelf farther.

It is not in the leaſt ſtrange that a Pin ſhould lie in the fleſhy Parts, ſince we ſee a Muſquet-Ball will lie there a conſiderable Time, without much injuring the Part; but how it ſhould paſs thro' the Membranes of the Stomach, without obſtructing it's Functions, and the Pullet thrive well after it, I leave it to others to determine.

Hydatides *incloſ'd with a* Stony Cruſt *in the* Kidney *of a* Sheep, *by Mr* W. Cowper, n. 307. *p.* 2304. Fig. 37. Fig 38. Fig. 39. Fig 40.

XVIII. In the *Sheep's Kidney*, which was order'd at a late Meeting of the Society, to be ſet aſide for me to examine, I found a large whitiſh Body, inclining to yellow, and ting'd with red, as it lay under the Membrane of the *Kidney*. This was very hard, as is uſual in Animal Petrifactions, two Thirds of it lay within the Subſtance of the *Kidney*: It was incloſ'd with a thick hard Membrane, that could not eaſily be ſeparated from it, even with a Needle fix'd in the End of a Stick. The Branches of the emulgent Veins and Arteries lay between it and the *Pelvis* of the *Kidney*; all which *Veſſels* were ſomewhat preſs'd by this petrified Body. As I was picking off it's thick ſtrong membranous Incloſures, I found the Needle ſlip into a Cavity at an *Aperture*, *Fig.* 38. By this I was inform'd (of what I muſt confeſs, before I had no Suſpicion of) that this hard and heavy *petrified Body* was hollow; whereupon I thought of dividing it with a *Saw*, but finding a membranous Interſtice in it, B, I pull'd it aſunder, *Fig.* 39. and found it's Inſide divided by many *petrified* Cells C, or irregular Figures, and fill'd with *Hydatides*, ſome of which are repreſented *Fig.* 40.

Fig 37. Fig. 37. *Repreſents the external Surface of the* Kidney *of a* Sheep.
A. *The* petrified Body, *as it appeared in it before Diſſection.*
Fig. 38. Fig. 38. *The inferior Surface of the ſame petrified Body, after the Membrane that incloſ'd it was taken off.*
a. *The Hole by which it was diſcover'd to be hollow.*
B. *The* Fiſſure *by which it was divided, to ſhew it's Inſide, expreſs'd.*
Fig. 39. Fig. 39. C, *It's* petrified Cells *that contain'd the* Hydatides.
Fig. 40. Fig. 40. D, *The* Hydatides *of various Sizes and Figures, taken out.*

The Bones *of a dead* Fœtus *taken out of the* Uterus *of a* Cow, *by Mr* B. Sherman. n. 323. *p.* 450.

XIX. The Cow was very unthrifty, for which they gave her Cow-Phyſick, and ſuch Drinks as they apprehended proper for her; notwithſtanding which ſhe grew worſe, and continued a great while in a lean, pining, waſting Condition, and was reduced to ſo weak a State, that they concluded ſhe would die; when on a ſudden ſhe began to eat her Meat, and did thrive ſo very faſt, that in ſix or eight Months ſhe was ſo fat as to be ſold to the Butcher; who when he kill'd her, found theſe Bones in her *Uterus*, which were very dry, there being no manner of Moiſture in the Bag (as he call'd it) in which the Bones were contained. The ſame digeſtive Humour, which diſſolv'd the Skin and muſcular Parts of the Calf, might (I preſume) reaſonably enough be ſuppoſed to diſſolve the Cartilages, and (for ought I know) even Part of the Bones in a *Fœtus*. Of what Age the *Fœtus* was, or whether if the Cow had not been kill'd, there would have been a total Diſſolution, I muſt leave to others to determine.

I am inform'd by ſome Phyſicians to whom I have ſhewn theſe Bones, that there are many ſuch Inſtances in Anatomical Writers; and particularly one of a Woman, whoſe *Fœtus* diſſolv'd ſo perfectly, that ſome of the Bones digeſted through her *Abdomen*, and (which I think is more ſtrange) that the ſame Woman had Children afterwards.

A Deſcription of the Wood-Pecker's *Tongue, by Mr* R. Waller, n. 350. *p.* 509.

XX. The *Picus Martius*, or Wood-Pecker, has ſeveral Particularities in the Structure and Mechaniſm of it's whole Body, which may deſerve a nice and accurate Obſervation and Deſcription: All which are wiſely contrived and adapted, either for catching Food and Suſtenance of the Individual, or continuing the Species.

That this Bird makes a round Hole even in ſound and hard Trees, ſuch as the Oak, Horn-beam, Beech, and the like, is commonly obſerved; and that within theſe Holes, the Hollow being enlarged, the Neſt is made, the Eggs laid and hatch'd; and the young Brood fed, as by other Birds.

For this purpoſe, that he may be enabled to perform ſuch hard Work, the Muſcles of his Neck, Breaſt, and Thighs, are exceeding ſtrong in proportion to the Bigneſs of the Bird: He has alſo a very firm ſtrong ſharp Bill, his Legs are ſtrengthen'd with very ſtrong Tendons; and his Toes, which are two before and two behind, (as it is in ſome other Birds) are provided with ſharp ſtrong hooked Claws or Talons: Beſides this, his Tail conſiſts of ten very ſtiff large and ſtrong Quills, firmly ſet into a robuſt ſtrong *Uropygium*, or Rump; ſo that when he has faſten'd his Claws and Feet into the Clefts and Inequalities of the Bark of the Tree, he claps his ſtrong Tail Feathers againſt the Body of the Tree; and ſo ſtands with his Head erect, to give the Strokes with his Bill with the greater Force.

That he is of the Inſectiverous Kind is certain, and lives not only upon Inſects catch'd creeping on the Outſide of Trees, but alſo on ſuch as are under the Bark, between the Bark and Wood, as likewiſe on thoſe in rotten Wood; and, as I am very confident on Worms and other Inſects in the Ground: For I have frequently obſerved the Roots of their Bills very dirty, as it is in *Crows* and *Rooks*, *&c.* Whence I ſuppoſe he ſtrikes his long ſharp Bill into the ſoft Earth to take the Worms out of it. I have alſo found their Craws full of ſmall Ants.

But the Contrivance and Mechaniſm of the Tongue in this Bird, being the moſt remarkable, I ſhall give ſome few Remarks of this curious Contrivance of Nature.

This Bird is known to throw out a long, ſlender, round Tongue, to a conſiderable Diſtance beyond the End of his Bill; and to draw it in again very quick into his Mouth or Bill, with the caught Inſect ſpitted on the Tip of it.

The *Chameleon* indeed darts out it's Tongue to a conſiderable Length; and having entangled the Fly in the glutinous Matter at the End of it, draws it into it's Mouth, together with the Prey; but the Mechaniſm in that Animal is wholly different from that of the preſent Subject; as may be ſeen by the Account the Gentlemen of the *Academy Royal* give thereof, in their *Memoirs* for a Hiſtory of *Animals*.

The Protruſion therefore of the Tongue to the Length even of three or four Inches in this Bird, being very extraordinary, and the Mechaniſm of the ſeveral Parts for that End no leſs curious; ſeveral learned and diligent Enquirers have attempted to explain it; but I am of Opinion they have been, in ſome Particulars at leaſt, miſtaken. I ſhall mention ſome of theſe.

Monſ. *Perault*, deſcribes it after this manner *.

This long Tongue he throws out by the means of two ſmall bony Cartilages, about ſeven Inches long, and of the Thickneſs each of a middling Pin, which are perfectly ſmooth and ſlippery. Theſe two Cartilages are united at the End, and being in this Place cover'd with Fleſh, make the Fore-part of the Tongue. The reſt of theſe Cartilages are ſeparated from each other, and paſs turning round under the Ears; and then riſing up behind the Head, where they meet again, they paſs over the Top of the Head, and ſo extend themſelves to the Root of the Beak. Theſe Cartilages which make the Hinder-part of the Tongue, are alſo encloſed in a Channel fleſhy on the Outſide, and whoſe Inſide is cover'd with a very ſmooth ſlippery Membrane.

Now theſe fleſhy Channels, which encompaſs and keep in theſe Cartilages, are the Muſcles by which the Tongue is mov'd; for having their Origin at the *Larynx*, and their Inſertion at the Extremities of the Cartilages, it comes to paſs, that when thoſe Muſcles of the two fleſhy Channels, which make the Hinder-part of the Tongue, are ſhortned, they force the Fore-part of the Tongue out of the Beak, by drawing the poſterior or fartheſt End nearer to the *Larynx*; and on the contrary, when the fleſhy Channel which makes the anterior Part, acts, it draws the Fore-part of the Tongue into the Bill towards the *Larynx*.

This Mechaniſm of making a hard Part, ſuch as the bony Cartilages are, to come out and return into another, ſuch as the Canals are, by the means of Cords drawing them, which are the Muſcles, is made uſe of in Coaches to pull up the Glaſſes of the Doors for the String, being faſten'd to the lower Part of the Glaſs-Frame, makes it riſe when drawn, which reſembles that Action of the Muſcles by which this Tongue is moved.

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* *Eſſays de Phyſique*, Tom. 3. Part. 2. p. 148.

Of theſe Cartilages and other Parts, and of the Head of the Bird, Mr *Perault* gives the Figures; but either the Wood-Peckers in *France* are different from ours in *England*, or this Figure of the Head is very ill deſign'd; it being much too broad and large, and the Beak too ſhort: Beſides he makes the two Cartilages to come to the Root of the Beak ſeparately, one on one Side, the other on the other Side of it; whereas in all the Wood-Peckers Heads I have met with, the two Cartilages join cloſe together about the Top of the Head, and thence proceed join'd, tho' not faſten'd to one another, a little ſlanting towards the right Noſe-Hole, where they end together.

Beſides, upon viewing and examining ſeveral Subjects, I could not find them agree in divers Particulars with his Account and Explication. For the Muſcles which are faſtened to the End of the Cartilages at the Root of the Upper Beak, are not inſerted at the *Larynx*, but paſs on and are faſtened to the lower Bill. This Pair I take to be the Muſcles chiefly concern'd in forcing the Tongue out of the Bill. There is another Pair of Muſcles, which being faſten'd to the Place where the two bony Cartilages are articulated with one ſingle Bone in the Fore-part of the Tongue (as is ſhewn in the 44th Figure) is, as I apprehend, the chief Pair concern'd in the drawing the Tongue with it's Prey into the Mouth. Theſe proceeding from that Articulation of the Cartilages as far as the *Larynx*, (each of them ſending a Branch to the *Cartilago Scutiformis*) from thence go on along with the Neck, (tho' not faſten'd to it) till they come within the Cavity of the *Thorax*, where they are inſerted under the *Clavicula* or *Merry-thought-Bone*, as 'till called. This Pair is repreſented by *k. k.* in the 42d Figure; and by *q. q.* in the 41ſt.

There is likewiſe a very ſlender white Thread, (whether Tendon or Nerve, I am uncertain) which accompanies this Muſcle it's whole Length; and which drawn gently, (for fear of breaking) pulls in with it the End of the Tongue. As there is ſuch another all along the *Vagina* to the End at *c*.

Volker Coiterus, as he is mentioned by *Gerard Blaſius*, in his *Anatome Animalium*, *Cap.* 24. *p.* 64. treating of the Tongue of this Bird, makes it to be made of three ſlender Bones, round, and, as he ſays, bound together, (*invicem colligatis*) which is a Miſtake; for though reckoning the two bony Cartilages for *Oſſicula* yet the third is not bound up with them, but articulated to the End of them. The ſame Perſon ſays the Tongue may be thruſt out to the Length of an Inch and a half, whereas when drawn in, it is ſcarce half an Inch long; when, in reality, it may be thrown out near four Inches; and I believe cannot be drawn in, ſo as to be leſs than an Inch and Quarter, *viz.* to that Place where the two Cartilages are articulated with the ſingle Bone. Beſides, he makes the Uſe of the long flat Muſcle running over the Top of the Head, to be (if I rightly apprehend his Meaning) to draw the Tongue to the upper Jaw, whereas their uſe is for thruſting the Tongue out of the Bird's Mouth.

But this Perſon having given no Figures, has render'd what he ſays leſs intelligible; tho' indeed he mentions two Pair of Muſcles, as there are ſo many chiefly concerned, yet there are at leaſt two other Pair, that aſſiſt that Performance.

The Account given by *Alphonſus Borellus* in his Treatiſe *de Motu Animalium*, Part II. pag. 24. is in ſeveral Reſpects likewiſe unſatisfactory; and the Figure given by him to explain it, very defective and ill deſign'd.

He makes the Pair of Muſcles concerned in thruſting the Tongue out, to be faſtened indeed, as they are, to the lower Beak towards the Point; but then he makes their Inſertion at their other End to be at the Extremities of the two *Oſſa Hyoïdea*; whereas they really reach to the very End of the long Cartilages that go round the Head: Theſe by another Miſtake, he makes to be the Retractors of the Tongue, and joins another Pair as Aſſiſtants in the ſame Action, which he makes to be twiſted ſpirally about the *Trachea.* None of all which agree with the Subjects I have met with, as will be ſeen by the Deſcriptions of my *Figures.*

In the Hiſtory of the *Academie Royale des Sciences*, publiſh'd in *Latin* by Monſ. *du Hamel*, 1698. *Lib.* 4. *Cap.* 5. there is another Deſcription of this admirable Contrivance of Nature, by Monſ. *Mery*, read at a Meeting of the Academy, *November* 16. 1695.

In this he differs from both *Perault* and *Borelli*, taking the horny End and Bone to which it is join'd, to be only the Tongue properly ſo called, and that the next two Bones anſwer the *Hyoïdes* with the long Cartilages annexed to them. But even in this he ſeems to me not to be ſo clear; confounding, as I apprehend, the two Bones with the Cartilages. He deſcribes the *Vagina*, in which the Bones and Part of the Cartilages are encompaſſed, and which is faſten'd to the horny End, and is protruded and drawn back with the Tongue: He takes notice of the little ſharp Points or Prickles on the horny Part being moveable, and with their Points bending towards the Throat; but I apprehend it is a Miſtake to make the mucous Matter glutinous, which is furniſh'd by the two *Pyramidal Glands*; for I take the Uſe of that *Mucus* to be chiefly, if not only, to lubricate the the Paſſage in the *Vagina*, for the more eaſy ſlipping of the Cartilages therein.

He deſcribes the Muſcles for exerting the Tongue, and extends them from their Inſertion at the lower Beak to the End of the ſpringy *Ligaments*, as he terms what I call *Cartilages*; to which he adds another ſmall Ligament capable of Extenſion, at the End of the other two next the Noſe, which when the Tongue is thruſt out, is relax'd and ſtretch'd. He alſo deſcribes the Pair of Muſcles faſten'd to the Root of the Tongue and *Os Hyoïdes*, ſerving to draw the Tongue into the Mouth: Theſe he makes to be wound round about the *Aſpera Arteria* once or twice, in which I think there is ſome Miſtake; being of Opinion the Mechaniſm for this Action of drawing in of the Tongue, is different from what is here deſcribed. I now proceed to the Explication of the ſeveral Draughts I made, with what Exactneſs and Care I could, in eight or ten ſeveral Subjects.

Fig. 41.

Fig. 41. Repreſents the Head with Part of the Neck of this Bird, the Skin being taken off, in which,

A. The Scull, having two ſhallow Grooves or Channels, or rather one broad one with a ſmall Riſing in the midſt, on the *Sinciput* or Back-part, from each Side of the Neck to the Top of the Head, where they unite into one, which paſſes ſlanting towards the right Side, and ends at the Hole for the Noſtril on that Side at *c*.

b. Is the Hole or Paſſage for Hearing.

d. A large white Gland, containing a glutinous Liquor almoſt like Cream as to Colour and Conſiſtence, which empties itſelf into the Mouth; I ſuppoſe to lubricate the Cartilages.

e. The Eye, which has a bony Ring, encompaſſing the *Iris*.

f. Part of the Tongue, which in this Figure is repreſented as almoſt all drawn into the Mouth, of which more when I come to deſcribe the Cartilages, *&c.* in the 42d *Fig.*

g. Part of the Neck, which is large and furniſhed with very ſtrong Muſcles.

h The *Oeſophagus*, opening very wide at the *Fauces*, and wholly muſculous.

i. i. i. A long, but thin and flat Muſcle in reſpect of it's Breadth, which is about ⅛ of an Inch, reaching from the End of the Cartilage at *c*, to the under Bill or Beak at *k*, to the Inſide of which it is very firmly faſten'd; as is ſuch another on the other Side.

k. The under Bill, very ſtrong and ſharp-pointed, articulated with he Skull a little behind the Ear-hole *b*.

l. l. l. The Cartilage on one Side, the other being exactly the ſame. his Cartilage is round, very ſmooth, even, and ſlippery, about the ze of a pretty large Pin; and reaches, when the Tongue is drawn in, and the Muſcle *i. i.* relaxed, from the Root of the upper Beak at *c*, to he Root of the Tongue properly ſo called, or to the Bones of the ongue where they are articulated, being bent like a Hoop, as in the

Figure, ſlipping very freely in a Sheath or membranous *Ductus* faſten'd on the outward or convex Edge of the flat Muſcle *i. i. i.* which Muſcle accompanies it from it's End at *c*, almoſt to the End of the Canal or Sheath, which opens at a Hole a little before the *Larynx*; (as will be ſhewn in the 43d Figure) and thence the Muſcle proceeds to it's Inſertion into the lower Beak at *k*. From the concave Edge of this Muſcle, there is a thin and tranſparent, but very ſtrong Membrane, ſtrained like a Drum-head to the Skull at *m*, where it is very ſtrongly faſten'd; this Membrane is furniſh'd with capillary Veins and Arteries, and doubtleſs is nervous. *n*, *n*, repreſent this Membrane. This Cartilage, when the Tongue is exerted, parts above half an Inch from the Root of the Beak at *c*.

o. o. A pretty large Vein and Artery.

p. p. A Muſcle reaching from one Jaw to the other, under the Throat, ſerving as a Bandage to keep in the Cartilages, and the Root and *Os Hyoïdes* of the Tongue, as I may call it, from ſtarting out at that Part where are the Articulations of the Cartilages with the Bones, when by the Muſcles inſerted into the Sheath at or near *p*, and thence paſſing to the End of the Tongue, it is drawn into the Mouth.

q. q. One of the laſt-mention'd Muſcles, which is round, and faſten'd to the Breaſt of the Bird, cut off at *r*.

s. The *Aſpera Arteria*, conſiſting of perfect Rings.

t. t. A Muſcle accompanying the *Aſpera Arteria.*

Fig. 42.

Fig. 42. *A. A.* The under Part of the lower Bill.

B. b. The Tongue.

b. The Place where the two Cartilages and two Bones repreſented by *f. f.* in *Fig.* 44. are brought into and incloſed in one Tube or membranous Sheath.

C. C. Two Glands diſplaced in this Figure.

c. c. Two Muſcles attending theſe Glands, and faſten'd near the End of the Bill.

d. d. The two bony Cartilages, bent, and paſſing on each Side of the Neck, but united at *b*.

e e e, *e e e.* The Pair of Muſcles, one attending each Cartilage from the End of it at the upper Beak, and firmly adhering to the *Vagina*, in which it ſlips, till about *f. f.*

f. f. The Place where theſe Muſcles leave the *Vagina*, and paſs on to the Inſide of the Bill, where they are inſerted. Their Action is to thruſt the Tongue forward, or out of the Mouth.

g. g. A Pair of Muſcles faſten'd a little below the *Larynx*, to the muſculous Part of the *Aſpera Arteria* at *i*; the other End of them going up to the Place *b* at the Root of the Tongue, whence they go on encompaſſed by the *Vagina* to the Articulation of the Cartilages with the two Bones. I take their Action to be to draw the End of the Tongue towards the *Larynx*.

k. k. Two Muſcles faſten'd at one End within the *Thorax*, under the Merry-thought or *Clavicula*; and at the other Ends to the Articulation of the Cartilages with the two Bones of the Tongue, mark'd *f. f.* in *Fig.* 44. Theſe have the forementioned Nerves accompanying them. I take theſe to be chiefly concern'd in drawing in the Tongue; each of theſe ſends a Branch to the Griſtle at the Top of the *Aſpera Arteria* at *n*.

l. l. l. l. Two Muſcles running along, and faſten'd to the Sides of the *Aſpera Arteria* from the *Thorax* to the Place where they are united, where each of them ſends a Branch; which binding over the Bones and Cartilages, goes on to the *Fauces*, where they are inſerted.

m. Part of the *Gula*.

n. A Cartilage at the Top of the *Aſpera Arteria*.

o. o. The *Aſpera Arteria*.

p. The Neck bending like an *S*. The Wind-pipe and *Gula* in this Bird paſs always on the right Side of the Neck.

Fig. 43. *A. A.* The two long flat Muſcles repreſented by *i. i.* in the 41ſt Figure. Theſe join cloſe to one another at the Top of the Head, and ſo paſs on together to the End of the Cartilages; to the End of which, as I take it, they are faſten'd; from whence a ſlender weak kind of Ligament reaches to, and is inſerted at the right Noſe-hole, at the Root of the upper Beak. This Ligament is relax'd when the Tongue is thruſt out. Fig. 43.

b. b. The Cartilages running in their *Vagina* on the Outſide of the ſaid Muſcles.

c. The *Larynx* or Paſſage to the *Aſperia Arteria*. I obſerv'd no *Epiglottis*.

d. d. Two Articulations or Joints in the under Beak or Bill.

e. The Hole or Paſſage, whereby the Tongue in it's *Vagina* comes out, and is drawn in again.

f. What I call the Tongue, in the Inſide of which the two Cartilages are brought together, 'till they are both articulated to one ſingle Bone, at the End of which is the horny barbed Tip.

g. One of the Pyramidal Glands.

h. The lower Bill.

Fig. 44. *A.* That Part which I think may moſt properly be called the Tongue; a ſmall Bone running thro' it: This, as far as *c*, is flat and thin at the Sides. It is cut away at *d*, to ſhew the Bones within it. Fig. 44.

b. The horny Tip of the Tongue, about a Quarter of an Inch long, ſtrong and ſharp, furniſh'd with four or five Barbs on each Side; (not with an infinite Number, as *Coiterus* ſays.) Theſe Barbs are ſharp and moveable, like the ſmall Teeth at the Root of the Tongue, and Beginning of the *Gula*, in the *Pike* and *Jack-Fiſhes*, in that of *Eagles* and the like; ſo as to let the Prey ſlip eaſily on, but not ſo eaſily get off again.

c. The End of the Bone of the Tongue where the two bony Cartilages are articulated.

d. The Place where the upper Part of the Tongue is cut away to ſhew the Bone.

e. Several ſmall Tendons, or rather, as I take them to be, Nerves running through the Tongue. Of theſe ſome go to the End of the Cartilages, others accompany the Muſcles to the Neck.

f. f. Two Bones or Cartilages, which in the Bird are united by a thin Membrane as far as the next Joint, ſo as to open aſunder to ſome diſtance, but not to ſeparate quite. Theſe two Bones ſeem to anſwer the *Oſſa Hyoïdea* in other Creatures. At the Place marked *g. g.* the Muſcle that draws the Tongue into the Mouth is faſten'd, or rather leaves the Tongue at that Place; it having it's Inſertion near to the End of it: This Muſcle is repreſented by *q. q.* in the 41ſt *Fig.*

h. h. The two bony and ſpringy Cartilages running on each Side of the Neck; which being joined cloſe together on the Top of the Head, paſs ſo joined to the Noſtril, or Noſe-hole, on the right Side.

From the Conſideration and comparing of theſe four Figures, the true Mechaniſm and Motion of the Tongue, ſeems to be in ſhort thus: The two long Muſcles inſerted near the End of this lower Beak, and reaching to the End of the Cartilages, being contracted, the round Hoop of the Cartilages is drawn up from each Side of the Neck, cloſe to the Pyramidal Glands; and at the ſame time the Muſcles that draw the Tongue into the Mouth being relaxed, and the Articulation at *c.* and *g. g.* in the 44th Figure, brought near to a ſtreight Line, the Tongue is thrown out the Length of 4 or 5 Inches.

But when thoſe long Muſcles are relaxed, the Pair of Muſcles repreſented by *k. k.* in the 42d Figure, being contracted, draw the Articulations *g. g.* where they are faſten'd, down into the Throat or wide looſe Skin of the Neck; and at the ſame time the Cartilages opening into a wide Hoop, the whole Tongue is drawn into the Mouth.

Fig. 45. *Fig.* 45. *A.* The Skull. *b.* The ſhallow *Crena* or Groove for the Cartilages. *c.* The Place for their ending at the right Noſe-hole. *d.* The Orbit of the Eye. *e.* The Hole for the Optic Nerve. *f.* A Hole or Paſſage thro' from one Orbit to the other. *g.* A Bone covering the Hole to the Ear. *h.* The lower Jaw and Bill. *i.* A Ridge or *Proceſſus* in the Skull, beginning at the Root of the upper Bill, and keeping the two Ends of the bony Cartilages in their Place on the right Side. *k.* The *Os Jugale.* *l.* The upper Bill.

Fig. 46.

Fig. 46. Repreſents the right Leg and Foot, in which there are two *Digiti* before, and two behind. The Strength, Largeneſs, and Sharpneſs of the hooked Claws or Talons are remarkable.

Fig. 47.

Fig. 47. *A.* The *Oeſophagus.* *B.* The *Ingluvies*, or Crop, partly muſculous, and lined with a glandulous Coat. This I found quite fill'd with ſmall black Piſmires; as alſo, *C.* the *Ventriculus* or Gizzard, which joined cloſe to the *Ingluvies.* *d. d. d.* The Inteſtines nearly of the ſame Bigneſs for the whole Length. *e.* The Beginning of the *Rectum.* *f.* The *Pancreas.*

Fig. 48.

Fig. 48. One of the middle Pair of Feathers of the Tail, in which the great Strength of the Quill for ſo ſmall a Feather, and it's bifurcate End, are very remarkable.

Fig. 49.

Fig. 49. The *Roof* of the *Mouth*, where 'tis obſervable, that the *Rima* or Paſſage for the Air to the Noſtrils, is beſet on each Side with a Row of 10 or 12 little ſharp Teeth, with their Points ſtanding inwards, towards the *Gula.* Theſe take the Prey from the End of the Tongue, whoſe Barbs or Prickles are moveable, and are to keep it from going out of the Beak again with the Tongue, and from hence it is convey'd to the Swallow.

The Natural Hiſtory *of the* Flamingo, *&c. by Dr* J. Douglas, N. 350. p. 523.

It's Name.

XXI. It was the Poet *Ariſtophanes*, that firſt makes mention of this Bird by the Name of Φοινικόπτερος (*a*), and not long after it is called ὄρνις Φοινίκεος (*b*) by *Philoſtratus*, in his Life of *Apollonius Tyanæus.* *Apicius*, *Plinius*, *Suetonius*, *Juvenal*, and other *Latin* Writers, retain the *Greek* Word, and call it *Phœnicopterus.* *Bellonius* (*c*) ſays, That in *French* it is named *le Flement*, or *Flambant.* *Scaliger* affirms, that in *Provence* they call it *Flammant*: And (*d*) *Geſner* ſays, it may be called *Avis Rubra* per excellentiam. (*e*) *Aldrovandus* writes, that in *Sardinia* it goes by the Name of *Fiamingo*; and *de Laet* tells us, that the *Spaniards* in the *Weſt-Indies* call it *Flamenco*. Dr *Charlton* and Dr *Grew* convert the *Greek* Appellation into *Engliſh*, naming it the *Phæcopter*: And Sir *Hans Sloane*, in his Catalogue of *Jamaica Birds*, annex'd to Mr *Ray*'s *Synopſis Avium*, ſtiles it the *Flamingo*. (*f*) *Du Tertre* calls it *le Flamand*, which differs but little from the Name given it by *Bellonius*: And to mention no more, (*g*) *Du Hamel* ſays, 'tis commonly call'd *Becbaru* in *France*.

All theſe differing Names may be eaſily accounted for, from the Colour moſt predominant in it's Wings. Thus *Martial* (Epigram 58. Lib. III.) ſays of this Bird:

Nomenque debet quæ rubentibus pennis.

(a) *Ariſtoph. Aves, Sc.* 4 (b) *Philoſt. Lib.* 8. *Pag.* 387. *Edit. Pariſ.* 1605. *fol.* (c) *Bellon. Hiſtoire des Oyſeaux, Lib.* 8. *Cap.* 8. (d) *Geſner Hiſt. Anim. Lib.* 3. (e) *Aldrov. Ornithol. Tom.* III. *Lib.* 20. *Cap.* 4. (f) *Hiſt. des Iſles*, &c. *p.* 300. (g) *Hiſt. de l'Acad. Royale, p.* 213.

And again (Epigr. 71. Lib. XIII.) he makes it give the true Derivation of it's own Name ;

Dat mihi penna rubens nomen.

The *Greek* Name is compounded of two, *viz.* Φοινίκιος, *puniceus, ruber*, and πτερὸν, *Ala*, a Wing, *quod ſit rubentibus Alis* ; which Thing in different Words is expreſs'd as follows, by the ſeveral Authors I have conſulted. *Bellonius* ſays 'tis called in *French*, *Flambant*, not only from the *Date*-Colour of it's Wings, *à Dactylorum colore*, i. e. a Scarlet or light Red, like the Fruit of the *Palm* or *Date*-Tree, called in *Greek* Φοῖνιξ ; but alſo from the Luſtre of the Colour reſembling Flame : Or, as *Aldrovandus* has it, *Quod velut ignis inſtar ejus rubedo emicit.* The Words of *Geſner* are, *Ego Gallicum nomen à rubro & flammeo roſtri, crurum, pennarumque in aliquibus partibus colore inditum eſſe conjecerim* ; *aut forte quoniam ex Flandria hyeme ad Narbonenſis Provinciæ maritima volat* ; *nam Flandrum Galli* Flammant *appellant : vel à corporis proceritate, quales ſolent eſſe Flandri.* Mr. *Willughby* (*h*) ſays the *French* name it thus rather from the flammeous Colour of the Wings and Feet, than that it comes in the Winter Time from *Flanders :* For he believes there was ſcarce ever ſeen in *Flanders* a Bird of that Kind ; ſo far are they from being common there, and flying from thence into other Countries. (*i*) Dr *Grew* believes it named in *Greek* from the Scarlet Colour of it's Wings ; and *Flamment* in *French* for the ſame Reaſon. *Du Hamel* explains it's Name *Becharu* by *Aratri-Roſtrum*, (*quaſi Bec-Charrüe*) *quoniam roſtrum ejus aratri inſtar inflectitur.*

It's Genus. All Authors, from *Ariſtophanes* down to *Aldrovandus*, have accounted the *Phœnicopteros* a Bird of the *Palmipede* or web-footed Kind ; and tho' this laſt-named Author will not allow it to be ſo, yet he is forced to own that it is not a true *Fiſſipede* or digitated Fowl ; *nam & membranæ digitos ſepientis quoddam habet rudimentum*, are his own Words. Dr *Charlton* only, among all the later Natural Hiſtorians, has approved of his Diviſion, and accordingly ranked the *Phœnicopter* in the Claſs of *Aquatick Fiſſipedes.* But that it is a Water-Fowl all agree ; *Ariſtophanes* calls it Λιμναῖος, i. e. *Paluſtris* ; and *Aldrovandus* ſays of it, *Avis eſt aquas amans :* not to mention others.

Species. I find Authors are ſilent as to the different Sorts of this Bird, only *Aldrovandus* gives us two Figures thereof that are not alike.

It's Place of Birth. This Bird is found in three of the principal Parts of the World, that is, in *Africa*, *America*, and *Europe.* *Heliodorus* (*Æthiop.* Lib. 6.) calls it Νειλῶον Φοινικόπτερον, a Bird of the *Nile* ; and the old *Scholiaſt* upon *Juvenal* (Sat. xi. ver. 139.) affirms, that *abundans eſt in Africa* ; and *Du Hamel*'s Words are, *Inter animantes quæ ſua mole*

(*h*) *Ornithologiæ, Lib.* III. *Sect.* 2. *Cap.* 1.

(*i*) *Muſæum Reg. Soc. p.* 67.

commendatur, Avis illa ex Ægypto allata eſt, quam Veteres ob plumas in Alis rubeas Phœnicopterum *dixere. John de Laet* writes, that there is an abundance of them in the Iſland of *Cuba*, as alſo at the Iſle called *Rocca*, lying on the Coaſt of the Province of *Venezuela* in *South America*; and *Rochfort* ſays the ſame thing of the Iſland of *St Domingo*.

(*l*) *Dampier* ſaw ſome few of them at *Sal*, one of the *Cape Verde* Iſlands: He hath likewiſe ſeen ſome of them at *Rio la Hacha*; alſo at an Iſland near the Main of *America* right againſt *Queriſao*, call'd by the Privateers *Flamingo Key*, from the Multitude of theſe Fowls that breed there; and he never ſaw of their Neſts and Young but three only.

Though theſe winged Creatures live for the moſt part in thoſe hot Countries, yet they ſometimes viſit us here in *Europe*, and ſo may be accounted among the Migratory Kind, or Birds of Paſſage, which is confirmed by the Teſtimonies of ſeveral Authors: For,

Bellonius told us long ago, *migrant ultrà mare*, and are often taken in *Italy*, and oftner in *Spain*.

(*m*) *Gaſſendus* ſays, they are frequently catch'd in the fenny Grounds and Marches about *Arles* in *Provence*, upon the *Rhone*.

Geſnerus. Quidam mihi retulit avem hanc non procul à Monte-Peſſulano *capi*. He ſays in another Place, that they ſwim in Flocks not far from the Shore *in Mediterraneo Mari Gallico*.

Willughby writes, that in hard Weather in the Winter Time, it comes over to the Coaſt of *Provence* (and is often taken about *Martiques*, a Sea-Port Town in that Country) and in *Languedoc*, and is frequently found about *Montpelier*. But whence it comes, and where it is bred, to me, ſays he, is unknown. *N. B.* This Paſſage is not in the *Latin* Edition of his Works, but added to the *Engliſh*, which was publiſhed two Years after the firſt. However, he ſays poſitively that they don't come from *Flanders*, where they are ſo far from being common, as ſome alledge, that there never was one ſeen in that Country.

(*n*) Dr *Charlton* informs his Reader, that he was preſented with the Skin of one of theſe Birds, well ſtuffed and dried, by a Gentleman at his Return from the Univerſity of *Montpelier*, near which Place it had been taken.

(*o*) Dr *Liſter* ſays, *Frequens eſt Phœnicopterus in paludibus maritimis ad mare Mediterraneum Provenciæ & Languedociæ*.

Whether this Bird were known to *Ariſtotle* is a Queſtion; for all our Writers of Natural Hiſtory agree, that the *Phœnicopterus* is no where mentioned by Name by that Philoſopher; yet they can hardly believe that he was ignorant of a Bird ſo clearly deſcribed by his Contemporary *Ariſtophanes*. *Mirum eſt*, ſays *Geſner*, *hujus tam pulchræ & eximiæ Avis*

(*l*) *Damp. New Voyage round the World, p.* 67. (*m*) *Gaſſ. Vita Peireſc. Lib..*II. *in fine.* (*n*) *Charlton de Differentiis & Nom. Animalium.* (*o*) *Liſter Annot. in Apicium Cœlium, Lib.* VI. *Cap.* 7.

nomen ab Ariſtotele taceri, cum Ariſtophanes, qui vixit eadem ætate, meminerit. Sed Græcis etiam raram eſſe hanc avem puto.

Bellonius thinks that *Ariſtotle* deſcribed this Bird under the Name of *Glottis* or *Lingulaca*, as *Theodorus Gaza* tranſlates it. *Aldrovandus* is of the ſame Opinion, but *Geſner* and *Scaliger* are not; for the firſt ſays, *Ego verò iis quas Gallinulas aquaticas noſtri vocant avibus Glottidem adnumero, quæ omnes fiſſipedes ſunt:* And the latter in his Commentary upon this Paſſage ſays, *Glottis autem quæ ſit nondum mihi conſtat. Ridiculum quod quidam de* Phœnicoptero *auſus eſt pronuntiare.*

It's Food, &c. *Geſner* ſays, *circa lacus & paludes vectitat*, and that it feeds on Periwinkles and Fiſh: and by *Dampier*'s Account we learn, that they delight to keep together in Flocks, and feed in Mud and Ponds, or in ſuch Places where there is not much Water; that they are very ſhy, and therefore it is hard to ſhoot them; that they build their Neſts in ſhallow Ponds, where there is much Mud, which they ſcrape together, making little Hillocks, like ſmall Iſlands, appearing out of the Water, a Foot and an half from the Bottom: They make the Foundation of theſe Hillocks broad, bringing them up tapering to the Top, where they leave a ſmall hollow Pit to lay their Eggs in. And when they either lay their Eggs or hatch them, they ſtand all the while, not on the Hillock, but over it, with the Legs on the Ground in the Water, reſting themſelves againſt the Hillock, and covering the hollow Neſt upon it with their Wings: For their Legs are very long, and building thus, as they do, upon the Ground, they could neither draw their Legs conveniently into their Neſts, nor ſit down upon them otherwiſe than by reſting their whole Bodies there, to the Prejudice of their Eggs or Young, were it not for this admirable Contrivance, which they have by natural Inſtinct. They never lay more than three Eggs, and ſeldom fewer. The young ones cannot fly till they are almoſt full grown; but will run prodigiouſly faſt. Thus far *Dampier*.

Du Tertre in the Hiſtory of the Iſles, *&c.* gives theſe further Circumſtances. *Theſe Birds*, ſays he, *have ſuch a ſtrong Tone of Voice, that no Body who hears them, but would take them to be Trumpets ſounding. They are always in Flocks, and while they have their Heads covered diving under Water for their Food, like Swans, they have always one upon the Watch, with his Neck ſtretch'd out, the Eye fully employed, and the Head turning perpetually from one Quarter to another: As ſoon as he perceives any Body a coming, he ſounds the Trumpet, gives the Alarm, mounts firſt upon the Wing, and all the reſt follow. They fly in Order like the Cranes; but if you can only ſurprize them, they are ſo eaſily killed that the leaſt Wound makes them fall to the Ground. They are very rare, and hardly ever ſeen except near thoſe Shores which are the leaſt inhabited.*

They flea them, and make a kind of Fur of their Skins, which are ſaid to be of great Uſe to People that are ſubject to Colds, and Weakneſs of the Stomach.

Rochfort (p) likewiſe informs us, That *they have the Senſe of Hearing, and Smelling to ſuch a Degree, that they diſcover thereby the Hunters, and Fire-Arms, at a great Diſtance. And to avoid being ſurprized, they ſituate themſelves in open Places, and in the middle of Marſhes, from whence they can perceive their Enemies at a Diſtance, and there is always one of the Flock upon the Watch. They are fat, and their Fleſh is very well taſted. The Skin, which is covered with a ſoft kind of Down, is preſerved for the ſame purpoſes as thoſe of the Swan and the Vulture.*

De Laet obſerves, that theſe Birds are ſo accuſtom'd to Salt Water, that the *Indians*, when they tame them, mix Salt with the freſh Water for them; elſe they pine away and die. And though *Ariſtophanes* ſays it is οὐ τῶν ἠθαδών, or not uſed to be tame; yet *Gaſſendus* writes, that *M. Varius*, Preſident of the Parliament at *Aix* in *Provence*, and a great Friend of *M. Peireſc*, uſed to divert himſelf with feeding them with Bread moiſtened with Water, which they commonly eat in the Night, and not in the Day-time. The ſame learned Perſon obſerved, that they could diſcern the Approach of cold Weather, and would come to the Fire, ſo as ſometimes to burn their Feet; and that when one Foot pained them, they would go upon the other, uſing their Bill inſtead of the burnt Foot: That they ſlept ſtanding upright on one Foot, with the other drawn up to their Breaſt amongſt their Feathers: And laſtly, that very little Sleep ſerv'd their turn.

This beautiful and ſcarce Bird was much eſteemed by the *Romans*, and chiefly made uſe of in their coſtly Sacrifices and ſumptuous Entertainments. Thus *Suetonius* (q) deſcribing the exquiſite Sacrifices which were appointed by the mad Emperor *Caligula* to be offer'd to himſelf, as a Divinity, ſays of them, *Hoſtiæ erant Phœnicopteri, Pavones, Tetraones, Numidicæ, Meliagrides, Phaſianæ, quæ generatim per ſingulos dies immolarentur.* And the ſame Hiſtorian relates further, (r) that this Emperor *pridiè quam periret ſacrificans reſperſus eſt Phœnicopteri ſanguine.* *It's Uſe.*

That the Tongue of this Volatile was much commended, and in great Eſteem, for it's excellent Taſte and moſt delicious Reliſh, will appear from the following Quotations. And firſt we read in *Pliny* (s) that *Apicius* ſaid the Tongue of this Bird was a delicious and ſavoury Bit, *Phœnicopteri linguam præcipui eſſe ſaporis Apicius docuit, nepotum omnium altiſſimus gurges.*

The Poet *Martial* ſays the ſame thing in the aforeſaid Epigram:

Dat mihi penna rubens nomen: ſed lingua guloſis
Noſtra ſapit.

(p) *Hiſtoire des Antilles.* (q) *Suetonii Caligula*, §. 22. (r) *Scalig.* §. 57. (s) *Plinii Nat. Hiſt. Lib. X. Cap.* 48.

And *Juvenal (t)* in that Satire where he expoſes the extravagant Luxury and Gluttony of the *Romans*, mentions this Fowl, amongſt ſome others equally rare, that they made uſe of in their Feaſts.

Et Scythiæ volucres & Phœnicopterus ingens.

We read in *Suetonius* how the Emperor *Vitellius* had them often ſerv'd at his Table, with a great many more Varieties brought from the moſt diſtant Parts of the Univerſe; his Words are, *(u) In hâc Scarorum jecinera, Phaſianorum cerebella, linguas Phœnicopterûm, Murænarum lactes à Carpathio uſque fretoque Hiſpaniæ per Navarchos ac Triremes petitarum commiſcuit*; hoc eſt, ab extremis imperii finibus Orientem verſus & Occidentem. And *Heliogabalus*, another of the *Roman* Emperors, as *Lampridius* writes, treated his Courtiers with ſumptuous nice Diſhes made of the Inwards and Brains of *Phœnicopters, exhibuit Palatinis ingentes dapes extis & cerebellis Phœnicopterorum refertas.*

What is related by *Gaſſendus*, in the Life of that learned Nobleman *Peireſkius*, is no Argument againſt the excellent Reliſh of the Tongue of this Bird: For his Friend *Varius*, who therein ſeems to contradict the receiv'd Opinion, was at that Time juſt upon the Recovery from a long Illneſs; he had no Appetite, loath'd all Sorts of Meats, and mended but very ſlowly; ſo that 'tis no Wonder if he did not perceive all the Reliſh of that nice Bit, for which of old it was ſo much commended. Beſides, his Anſwer is not as to the Tongue, which was own'd to be much ſweeter than that of a Kid, but to the Fleſh of this Bird (as will appear from the Original). *Rogatus ſubinde fuit de ſapore carnis Phœnicopteri. Excepit autem mirari ſe, cur illam Apicius apud Plinium, & Imperatores Caligula & Vitellius apud Suetonium, Heliogabalus apud Lampridium, & nonnulli alii tantis in deliciis habuiſſent. Eſſe enim eam injucundam, aut ſaporis certe non exquiſiti, aquaticarum aliarum inſtar, cum etiam piſcem oleat; unde à Provincialibus ut plurimum abjicitur, exuviaque ſolum ſunt uſui in faſtuoſis conviviis, carnibus aliarum avium obtegendis.*

The way to dreſs the *Phœnicopter*, and how to make a Sawce fit for it, we may read in *Apicius*'s Book *de Obſoniis & Condimentis, ſeu de Arte Coquinariâ*, Lib. VI. C. 7.

Draw, waſh, and boil the Phœnicopter; *put it into a Pot, with a moderate Quantity of Salt and Vinegar; and when it is half boiled, put in a few Leeks, and a little Coriander Seed, when it is almoſt enough boiled, add Defrutum to Wine that has been boiled till a third Part is evaporated, and colour it, then add Pepper, Cummin Seeds, Coriander, the Root of Laſerpitium, Mint, and Rue, all pounded in a Mortar. Stir it very well, pour ſome more Vinegar to it, and add ſome Carrot, then pour in ſome of it's own Broth, boil it again, thicken it with Starch, pour it off, and ſerve it up.* Or, *you may roaſt it, having ſtuffed it with round Pepper,*

(t) *Juvenal. Sat.* XI.

(u) *Suetonii Vitell.* §. 13.

Lovage, the Seeds of Smallage, and Seſame, Defrutum, Parſley, Mint, dried Onions, and Carrot; with Honey, Wine, the Drippings of the Fowl, Vinegar, Oil, and Defrutum, for Sauce.

Philoſtratus reckons the Red Coloured Fowl, *i. e.* the *Phœnicopter*, amongſt the delicious Diſhes, *Lib. VIII. Vitæ Apoll.*

Wormius ſays (*x*), That the Tongue of this Fowl was extremely liked by the Ancient *Romans*, as *Apicius* and other Managers of Feaſts relate.

Dr *Grew*. The Tongue of this Bird, as *Apicius* ſaid, was a delicious Morſel amongſt the *Romans*.

N. B. In the *Treatiſe de Obſoniis & Condimentis*, that goes under the Name of *Apicius*, there's no mention made of the *Tongue* of this Fowl: For, as Dr *Liſter* well obſerves, *Apicius noſter hic ſilet de linguæ præcipuo ſapore.* Which is a pretty convincing Proof, that this Book *de Re Coquinaria*, is only a Collection made by ſome modern *Roman*; the Name of the old *Apicius*, that great Maſter of the Art of Eating, being only prefixed to it, for the Benefit of the Bookſeller.

Dampier. The Fleſh of both young and old is lean and black, yet very good Meat, taſting neither fiſhy nor unſavoury: A Diſh of *Flamingo*'s Tongues being fit for a Prince's Table. They are large, having a large Knob of Fat at the Root, which is an excellent Bit.

Du Tertre. *It's Fleſh is excellent, though it ſmells a little of the Sea; but eſpecially it's Tongue paſſes for the moſt delicious Morſel in the World.*

Deſcription of it's Parts.

According to *Bellonius* this Bird is of the Bigneſs of the Fowl he calls *Elorius*, which is our *Curliew*.

Magnitude.

Scaliger compares it to the *Heron, magnitudo ei Ardeæ.*

Geſner ſays it is as big as a *Ciconia* or *Stork*, or rather bigger.

Aldrovandus *ſays, I can aſſert nothing certain of the Size of this Fowl, for I never ſaw it.*

Dampier. The *Flamingo* is a ſort of large Fowl much like the *Heron* in Shape, but bigger, and of a reddiſh Colour.

Du Tertre. *The* Flamand *is a Fowl as large as a Wild Gooſe.*

The Neck.

It hath an extraordinary long Neck, according to Mr *Willughby*.

Du Tertre. *It has a red Neck, very ſhort in Proportion to the Size of the Fowl, and about half a Toiſe in Length.*

The Tail.

Scaliger. *It has a very ſhort Tail, and as it were cut off.*

The Head and Bill.

Scaliger writes, that the Bill of this Fowl is neither quite ſtreight, nor altogether crooked, *but rather reſembles part of a* Scythian *Bow.*

Geſner, who compares this Bird to the *Crane* for Bigneſs adds, *that it's Bill is about half as long again as the Bill of the* Stork, *thick above and rough with certain Tubercles.*

Aldrovandus commends the Account *Scaliger* gives of the Bill, and then adds, *In the Conformation of the Bill, Nature has varied not a little: For it is not flat, like that of* Ducks *and* Geeſe, *though it is ſomewhat*

(x) *Muſæum.*

broad, neither is it ſtreight and round, like that of the Heron, *nor is it hooked like the Beaks of the* Eagle *or* Hawk, *or other Birds of Prey; though at the ſame Time it is crooked and bent a little downwards; but in the middle of the upper Jaw there is a remarkable Protuberance, ſix Finger's Breadth long, hollow within, and channelled in it's Middle. The upper Jaw is likewiſe longer than the lower one, and ends in a ſharp Point; but, on the contrary, the lower is by far the thickeſt of the two.*

Du Tertre. *It has a ſmall round Head, with a large Bill, four Inches long, half red and half black, and crooked in the manner of a Spoon.*

Olaus Wormius gives the following Deſcription of the Head and Bill of the *Phœnicopter*, which he had ſent him from a Friend, *viz.*

The Head and Bill were upwards of eight Inches long, the Head itſelf without the Bill, three Inches. The Bill has the ſame Figure which Scaliger *has given of it, pretty thick in the middle but hollow, and it's upper part channelled or grooved on each Side. At it's Origin it has two large Orifices for Smelling, it is hooked at it's Extremity, ſet round with Teeth internally, with a Spine or Eminence in it's Middle. It's lower Part is black, with a great many Streaks running towards it's Extremity, it is ſhorter than the other, but large and capacious, for receiving the large Tongue, which in this one had been taken out.*

Dr *Grew* has obliged us with a very curious Account of the Bill of this Bird, for which he ſays it is moſt remarkable. The Figure of each Beak is truly Hyperbolical: The upper Jaw is ridged behind, before plain or flat, and pointed like a Sword, with the Extremity bended a little downwards: Within it hath an Angle or ſharp Ridge, which runs all along the Middle, at the Top of the Hyperbole, not above a quarter of an Inch high: The lower Beak in the ſame Place above one Inch high, hollow, and the Margins ſtrangely expanded inward, for the Breadth of above a quarter of an Inch, and ſomewhat convexly. They are both furniſhed with black Teeth, as I call them from their Uſe, of an unuſual Figure, *ſcil.* ſlender, numerous, and parallel as in Ivory Combs; but alſo very ſhort, ſcarce the eighth part of an Inch deep. An admirable Invention of Nature, by the Help of which and of the ſharp Ridge abovemention'd, this Bird holds his ſlippery Prey the faſter.

Mr *Ray* deſcribes the Bill to be *broadiſh, of a ſingular and unuſual Figure*, viz. *the upper Jaw crooked, flat, and ſet round with Teeth, and the lower one thicker.*

Menippus, the Cynick Philoſopher, in a Fragment of his *de Homine* (which however at this Time is either loſt, or at leaſt hard to be come at) affirms this Bird to move it's upper Jaw, as we find him quoted by (y) *Rondeletius*, where he is talking of the *Crocodile*'s moving that Mandible: *But*, ſays he, *that is not peculiar to the* Crocodile *alone, for amongſt Birds the* Phœnicopter *moves the upper part of his Bill, as* Menippus *the Philoſopher has obſerved in his Book* de Homine.

(y) *Rondel. Lib. de Amphibiis. Cap.* 5.

Geſner makes the ſame Quotation from *Rondeletius.*

Cardanus (y) repeats the ſame thing, without mentioning any Author; *For ſome,* ſays he, *think that the Bird called the Phœnicopter moves the upper Jaw likewiſe.*; but adds however, *that the Reaſon for it is not ſo plain in the Fowl as in the Crocodile.*

Wormius is of the ſame Opinion; but with *Cardan,* he thinks the Cauſe is not ſo manifeſt as in the Crocodile.

Dr *Charleton* ſays, that it was *Cardanus* that firſt made that Obſervation.

Dr *Grew* argues for this Movement from the peculiar Structure of the *Roſtrum*; alledging, however, that there can be no Determination of theſe matters, without Inſpection into the Muſcles, and the Articulation of the Bones. As for the *Phœnicopter,* ſays he, it muſt needs be ſaid, that the Shape and Bigneſs of the upper Beak (which here, contrary to what it is in all other Birds that I have ſeen, is thinner and far leſs than the nether) ſpeaks it to be the more fit for Motion, or to make the Appulſe, and the nether to receive it.

Legs and Feet.

Bellonius remarks, that the Legs of this Volatile are very long. And on the contrary,

* *Scaliger* ſays, *that the Legs and Thighs are ſo ſhort, that as* Galen *reckons theſe Parts to be longeſt in Men, ſo he might reckon them the ſhorteſt in this of all Animals that we know.* For which he is ſeverely taxed by Dr *Charleton,* who ſays, *Here occurs an egregious Error of* Scaliger, *which I cannot help taking notice of: For he in his Obſervations upon* Ariſtotle's *Hiſtory of Animals* (This is wrong quoted, the Place being in *Ariſtotle's* Book *de Generatione Animalium*) *giving a prolix enough Deſcription of the particular Marks of the* Phœnicopter, *makes both it's Thighs and Legs to be very ſhort (in the Words above quoted) whereas this of all Fowls has theſe Parts the longeſt, as every Body who has ſeen them either alive or dead will teſtify. And who, I pray, has ever ſeen any of the Water-Fowls, that are cloven footed and live upon Fiſh, have ſhort Legs? no Body, I am ſure, neither is it reaſonable to think, that thoſe Fowls which live on Fiſhes which they catch in Lakes and Streams of Rivers, not by ſwimming, but rather wading, ſhould be ſo ill provided with Legs fit for that purpoſe, and ſo abſolutely neceſſary for procuring their Food. Beſides, the Reaſon why it was called by* Juvenal Phœnicopterus ingens, *was becauſe of the Largeneſs of it's Legs and Neck.*

Dr *Grew* obſerves the ſame miſtake, but in fewer Words, which are the following. *When* Scaliger *therefore ſaith that this Bird hath the ſhorteſt Legs of any Animal yet known, he would have ſaid the longeſt.*

Geſner ſays, *It has red Thighs larger than thoſe of the Crane.*

Du Tertre. *It is the talleſt Fowl I ever ſaw in my Life; it has red Legs, and the Feet half greeniſh or Sea-colour'd.*

(y) *Cardan. de Varietate Rerum, Lib.* 7. *Cap.* 37. * Scalig. *Exercit.* 233. §. 2. *de Subtilitate, ad* Cardanum.

Rochfort. (z) *Their Legs and Thighs are ſo tall, that their Body is full two Feet above the Ground.*

Colour of the Wings.

Scaliger thus elegantly expreſſes the fine Colour of it's Wings. *Cinereum colorem nobilitant alarum puniceæ pennæ. The Scarlet Feathers adorn it's Aſh-colour'd Wings.*

Aldrovandus. *It is ſurprizing that* Scaliger *took no Notice of the black Colour of it's Wings. The reſt of the Fowl is of an Aſh-colour, mixed with purple and white.*

Geſner ſays, *that the lower Part of it is white, with red Feathers upon it's Neck, Breaſt, Belly, and Wings.* And ſpeaking of one taken near *Montpelier*, he tells us, *that it was all white, except thoſe Parts of the Wings which are black in Storks.*

(*) De Laet *obſerves that they differ in Colour; for while they are young their Feathers are white; afterwards as they grow up, they become more of a Roſe Colour, and at laſt when they become old, they are quite red. There are ſome of theſe ſame Fowls near* Montpelier, *which have only the under Part of their Wings and Bodies red, and the upper Part black. There are likewiſe ſome of them in the Iſles, which have a Mixture of white and black Feathers upon their Wings.*

Du Tertre gives much the ſame Account. *The young ones,* ſays he, *are a great deal whiter than the old ones, and they redden in proportion as they advance in Age. I have likewiſe ſeen ſome of them, which had a mixture of red, black, and white Feathers upon their Wings, and I believe theſe are the Males.*

(†) Conſtantinus. *The Bill, the Legs, and part of the Wings are of a red Colour.*

Willughby ſays, the Neck and Body is white: The *Alarum Remiges*, or Quill-Feathers of the Wings, are black: but the *Veſtitrices*, or Covert-Feathers, are wholly dyed with a moſt beautiful bright Purple, or Flame Colour, *unde ei nomen.*

Dampier. The young ones at firſt are of a light grey; and as their Wing-Feathers ſpring out, they grow darker, and never come to their right Colour, or any beautiful Shape, under ten or eleven Months old. When many of them are ſtanding together by a Pond's Side, being half a Mile diſtant from a Man, they appear to him like a Brick Wall; their Feathers being of the Colour of a new red Brick: And they commonly ſtand right and ſingle, one by one exactly in a Row, except when feeding, and cloſe by each other.

Colour of the Feet.

All Authors agree in the red Colour of it's Legs and Feet. Thus *Scaliger, the Legs and Feet are of the ſame Colour with the Wings.*

Geſner ſays, *It is of a red Colour like that of Blood.*

Colour of the Bill.

Aldrovandus obſerves, *That that Part which joins on to the Head is ſomething between a white and a cheſnut Colour, the reſt is black.*

(z) *Hiſt. des Antilles, Edit. Rotterd.* p. 583. (*) *Hiſt. du Nouveau Monde, Lib.* 1. *Cap.* 9. & *Lib.* 18. *Cap.* 15 (†) *Conſtant. Lexicon Græco-Latin.*

Willughby affirms, that the Tip of the Bill is black, or of a dark blue.

The whole Fowl is delineated by *Geſner* and *Aldrovandus*; and Dr *Grew* has given us the Figure of the Head and Bill, as he found it amongſt the Rarities in *Greſham* College. *N. B.* The Figure of the *Phœnicopter* in *Willughby*, is copied from the ſecond of *Aldrovandus*. *Geſner* ſays, the *Phœnicopterus*, whence his Figure was taken, was ſent to him by *Rondeletius*. *Aldrovandus* had the firſt of his Figures from *Sardinia*; and the ſecond, which he calls *Phœnicopterus alter roſtro lato*, was given him by that famous Botaniſt *Carolus Cruſius*: He owns that he never ſaw the Bird himſelf.

The Figures given of it.

In *de Rochfort*, the Body and Neck of the *Flammant* is pretty well delineated; but the Legs are not, neither is the Bill, nor the Claws.

(a) *Du Hamel* gives a very exact Account of this Bird in the following Words, with which I'll cloſe this tedious Deſcription, collected from all the Authors that have made any mention of the *Phœnicopter* or *Red-Wing*. *It has a long Neck and Legs, with a ſlender but firm Foot. It's Eyes are narrow and of a red Colour; and it's Gall-bladder hangs down from the lower part of the Liver, that Veſſel which ſupports it, and by which it receives the Bile, is large, contrary to what is obſerved either in Man or Quadrupeds; for in them the Roots of the Gall-bladder are very ſlender. The Oeſophagus at it's beginning is very narrow, and becoming gradually larger terminates in a large Bag, the Crop: The Stomach has almoſt the ſame Appearance with that of a Hen although it does not eat Grain, but only ſmall Shell-Fiſh, which are rubbed by the Muſcles of the Stomach the ſame as Grain. This Author tells us that the* Phœnicopter *was diſſected by Monſieur* Perault *at* Paris.

It's Wings being drawn out are of a Red Colour, whence it is commonly called Flamand, *not upon account of it's being found in the* Low-Countries, *or* Flanders, *but becauſe it's Feathers, when viewed through a pellucid Membrane, appear of a Flame Colour. There is hardly any Fowl larger than this; and it's Bill is crooked downwards on both Sides, which is peculiar to it alone; for it is bent like a Plough, and hence it is commonly called* Becharruë, *or Plough-Bill, from it's reſemblance to a Plough. Thus far* du Hamel.

I now proceed to the Explanation of the Figures, which were drawn from a *Flamingo* that was ſent to Mr *Botley* to be ſtuffed.

Fig. 50. Gives a Side-view of the *Head* and *Bill*. Fig. 50.

Fig. 51. In this is repreſented a Front-view of the ſame Parts. Fig. 51.

Fig. 52. Exhibits the under-ſide of the *Tongue* next the under Bill. Fig. 52.
which *a* denotes a cartilaginous Subſtance that covers the Tip or Ex- mity of the *Tongue*; *b* a glandulous Subſtance at it's Baſis; *c* the orns of the *Os Hyoïdes*.

(a) *Hiſt. Acad. Royale, Edit.* Paris, *p.* 213.

Fig. 53. *Fig.* 53. In this the upper-ſide of the *Tongue* is fairly delineated, upon which we ſee two Rows of ſtrong *Papillæ Nervæ*; their *Apices* or Points turning inwards, for the better Retention of the Prey.

Fig. 54. *Fig.* 54. In this the *Tongue* is drawn in a lateral View, that we may have a Proſpect of the true Figure of theſe *Papllia*, which being hooked and turn'd backwards prevent, in a great meaſure, the Return of any little Animal ſwallow'd alive, which they feed upon.

Fig. 55. *Fig.* 55. The *Cornua* or Horns of the *Os Hyoïdæum.*

The Anatomy of the Heart *of* Land-Tortoiſes *of* America. *By Mr* P. Buſſiere, n. 328. *p.* 170.

XXII. Mr *Mery* having (in the Memoirs of the Academy Royal of Sciences, *Anno* 1703.) endeavour'd to maintain his erroneous Opinion, concerning the Uſe of the *Valves* which cover the *Foramen Ovale* in the Heart of an human *Fœtus*; by the Compariſon of the *pretended* Valves, which he *imagines* to be in the Heart of the *Land-Tortoiſes* of *America*, in the *pretended* Ventricles of the Heart of that Animal; and three Commiſſaries of Reputation, deputed by the *Academy*, having given an authentick Approbation to what is advanced by that Anatomiſt; I took care to have ſome brought from *America*, to let the World know the true Structure of the Heart of this Animal, which, of all that might have been choſen, is the moſt proper to convince Mr *Mery* of his Miſtake, and confirm the Uſe of the *Valve* of the *Foramen Ovale* in the Heart of an human *Fœtus*, eſtabliſh'd firſt by Dr *Harvey*, and confirmed and demonſtrated by all Anatomiſts ſince his Time. The Structure of the Heart of this Animal being very ſimple, and the Uſe of the double *Valve*, which covers the two *Foramina* of the *Auricle*, in the *ſole Ventricle* of the Heart, ſo plain and ſo manifeſt, that 'tis not poſſible to miſtake, as it will be acknowledg'd by the Deſcription of it's Parts and it's principal Veſſels. I diſſected three ſucceſſively of the five I received from *Jamaica* in *September* laſt, being yet alive, in the Preſence of Dr *Sloane*, Dr *Sylveſtre*, Mr *Pujolas*, and Mr *Laſage*, an able Surgeon of *London*. The other two being dead by that time, I cauſed their Hearts to be taken out entire; one of which I ſent to be diſſected in *Paris*, and I kept the other, to ſatisfy the Curioſity of thoſe who would ſee it.

A Deſcription of the Heart.

The Heart in this Animal is ſituated in the *anterior* Part of the Capacity that maketh the *Abdomen*, ſeparated from all the other *Viſcera* by a large *Pericardium*, which encloſeth it. This *Pericardium* is faſten'd by it's *ſuperior* Part to the Spine of the Back, by the *anterior* to the Muſcles of the Neck; which is the Cauſe that the Heart moveth forward when the Animal putteth forth his Head out of the Shell, and backward when he draws it in: By the *inferior* Part it adheres to the *Peritonæum*, which is faſten'd to the lower Shell; ſo that by all thoſe Ligaments the *Pericardium* is kept diſtended ſufficiently, that the Heart hath an entire Liberty in it.

In this *Pericardium* there is found a good Quantity of a very clear and tranſparent Water, which hath the ſame Uſe there, as that which is found in the *Pericardium* of other Animals.

'Tis in the Middle of this *Pericardium* that the Heart is ſuſpended; to wit, at it's *Baſis* by the Arteries, and at it's inferior Part by a little Tendon, or a very thin Ligament, which, from the Point or Cone of of the Heart, aſcendeth to inſert itſelf to that Part of the *Pericardium* which adheres to the Back.

This little Ligament is very remarkable in this, that by it's means the Point of the Heart is ſuſpended on the Level of it's *Baſis*; without which 'tis viſible that the Point of the Heart would fall lower, and bend the Veſſel of the *Baſis*, which might have interrupted the free Circulation of the Blood, and by conſequence would have endanger'd the Life of the Animal.

The *Pericardium* being opened, the Heart appeareth as if it was ſtanding by itſelf, being only fixed to the Arteries which go out of it (ſuppoſing the Animal turned upon it's Back) it's *Auricles* being ſeparated and hid under it's *Baſis* and Arteries, towards the Back of the Animal; which is very different from the Sea-Tortoiſes, where the *Auricles* are ſituated on the Right and Left Angle of it's *Baſis*, by which Way they puſh the Blood into the Heart.

The Figure of the Heart of this Animal is almoſt lenticular; making nevertheleſs three obtuſe Angles, two on the *Baſis*, one to the Right, and the other to the Left; the third is at the inferior Part, where the little Tendon, which ſuſpendeth the Heart on the Level of it's *Baſis*, is inſerted.

If this Animal be opened alive, you have the Satisfaction to ſee the Circulation of the Blood, by reaſon of the Tranſparency of the Membranes of the Veins, and the Alternative Motions, or Dilatations of the Heart and Auricles, and the Arteries and Veins, which are very ſlow in this Animal.

From the *Baſis* of the Heart paſs out four great Arteries, that appear diſtinctly ſeparated one from the other; whereas in that of the Sea-Tortoiſe, theſe Arteries are involved, for the Length of an Inch, in a *Capſula* common to them all, which maketh them to appear as if they were but one Trunk. If theſe four Arteries be entirely cut, the Heart is no more ſuſpended, but by the Conjunction of the two *muſculous Conduits* of the *Auricles*, which pierce the Heart in it's *poſterior* Part, towards the Middle of the Heart, on the Left Side; by which the Blood runneth from the Auricles into the *Ventricle* of the Heart.

Theſe Arteries being thus divided, and the Heart turned over, the *Auricles* appear lying tranſverſely againſt the Back, in the Capacity of the *Pericardium*: They make but one continued fleſhy Body, a little extended, about two Thirds inclining to the left Side. 'Tis in this Body that the Cavities of the *Auricles* are ſeparated the one from the other, by a *muſcular Septum*, ſituated internally to that Place, which appears contracted externally. Theſe *Auricles* make a *muſcular* Production about ſix Lines long, which uniteth them to the Heart, towards the Middle and Left of it's Backſide. This Production is compoſed of two Conduits, ſeparated only from one another by the Extenſion of the *Septum*, which divideth the two *Auricles*: It is by theſe two Conduits that the Blood floweth from the *Auricles* into the Heart. The Body of theſe *Auricles* hath no Adherence to the *Pericardium*, nor any Support but that of the Veins, which end in it; for if you divide theſe Veins, the Heart and *Auricles* come out of the Body; and then if you ſuſpend the Heart by the *Auricles*, they reſemble two Funnels joined together, the little End of which opens into the *Ventricle* of the Heart, to pour the Blood into it: And 'tis in this manner we are to conceive them, in the natural Situation of the Animal.

After having thus conſider'd the external Parts of the Heart and it's *Auricles*, we are to proceed to the Examination of the Inſide of both of them. In order to that, it muſt be open'd at it's inferior Surface, (ſuppoſing the Animal turned upon it's Back) becauſe all the Orifices of either the Arteries and Veins, and their *Valves*, are in the oppoſite Side: Therefore a Probe may be introduced thro' one of the Arteries into the Heart, and it open'd upon it; after that, you cut all this Side round about the inferior Circumference, from one Angle to the other, and then turn over all that Part which is cut on the *Baſis* of the Heart: For then it is eaſy to remark and view all the internal Parts of an Heart, and obſerve that there is but one ſole *Ventricle*, which comprehends the whole Extent of the Heart, and is as uniform and plain as either of the *Ventricles* of the human Heart, or of any other Animal whatſoever; and that it is impoſſible to remark any kind of *Septum*, either muſculous or membranous, that might make any Diviſion or *Cellule* in this *Ventricle*: And 'tis very ſurprizing, that the Anatomiſts of the Royal Academy of *Paris* have ſhewn, the one three, and the other four *Ventricles*, in the Heart of a Land-Tortoiſe of *America*.

After having conſider'd the Extent of the Cavity of the Heart, there remain two Things to be examin'd. The firſt is, that in it's Back-part, there are five Holes or Orifices, two whereof are on the left Side: Theſe are the Orifices of the two Funnels of the *Auricles*: They are cover'd by a large *Valve* lying flat upon them, ſupported in it's Middle by the Prolongation of the *Septum*, which divides the *Auricles* in ſuch a manner, that half of it covers the Orifice of the right *Auricle*, and the other half that of the Left; ſo that this *Valve* reſembles two Folding-Doors of a Porch, which have the ſame Support, and whereof one opens or ſhuts to the Right, and the other to the Left. It is viſible, that this *Valve* permits the Entrance of the Blood into the *Ventricle* of the Heart, but oppoſes it's Return into the *Auricles*; becauſe this Blood being once in the Heart, preſſes by it's own Weight upon this double *Valve*, and keeps it cloſe and flat upon theſe Orifices; which confirms perfectly well the Office of the *Valve*, which is in the *Foramen Ovale* in the Heart of an human *Fœtus*, the Diſpoſition being entirely the ſame. The other three Holes lying on the right Side of the *Ventricle* of the Heart, are the Orifices of the four Arteries which come out of the *Baſis*: Of theſe three Holes, that which is the moſt Left, is the Orifice of the Pulmonary Artery; that which is the higheſt, is the Orifice of the *Aorta ſiniſtra deſcendens*; and that which is the moſt to the right Side, is common to the *Arteria Aorta dextra*, and to the *ſuperior Aorta*. Each of theſe Orifices is furniſh'd with two Semilunary *Valves*, which permit the Blood to paſs without Difficulty from the *Ventricle* of the Heart into the Arteries, but hinder it's Return into the Heart. 'Tis a pure Illuſion, to place theſe Holes in different *Ventricles*; they are all in one and the ſame Cavity; ſo that the Blood enters into this only Cavity, by the two Holes which are on the left Side, and goes out of this ſame *Ventricle*, by the three Holes which are on the right Side.

The ſecond Thing remarkable in this Ventricle, is the Fibres of the Heart. They are of two Sorts; ſome are External, diſpoſed under the common Membrane in ſeveral Plans, very ſmall, but obliquely circular, extending from the *Baſis*, but particularly about the Arteries, which ſerve them inſtead of Tendons or Points of Support, towards the inferior Circumference of the Heart: The other muſculous Fibres which compoſe the Heart, are in a manner of ſeveral Columns, as thoſe of the Human Heart; they are ſituated internally in both Sides, lying obliquely from the Right, where their Tendons are about the Arteries to the Left; which demonſtrates that their Action is from the left to the right Side, where the Orifices of the Arteries lie open to let the Blood paſs out.

It has been ſaid before, that the two *Auricles* of the Heart of the Land-Tortoiſe of *America*, make externally but one continued Body; but that it has internally two Cavities, ſeparated from one another by a muſculous *Septum*. This *Septum* ſeparates them ſo exactly, that there is not the leaſt Communication of the one with the other; ſo that the Blood of either *Auricle* does not mix with that of the other, but in the Ventricle of the Heart. The right Auricle is as big again as the Left; all the Blood of the Animal (that of the Lungs excepted) paſſing thro' it to go into the Heart; the left Auricle receiving only the Blood which cometh from the Lungs, the Pulmonary Veins being very ſmall. The internal Part of the *Auricles* are furniſh'd with little muſculous Columns, but particularly at their Extremities, ſituated in ſuch a manner, that it is viſible their Action tends to puſh the Blood againſt the *Septum*, where the Conduits, which convey it into the Heart, are ſituated.

There is in the Bottom of the right *Auricle* an oblong Orifice, by which the Blood cometh into it's Cavity from the great Reſervoir of the Veins, ſituated on the back-part of the Heart. This Orifice is furniſh'd with two Semi-lunar oblong *Valves*, diſpoſed in ſuch manner, that when the *Auricle* is relaxed, the Blood enters it's Cavity, but when contracted, they ſhut cloſe to hinder the Blood from returning into the Veins: The Orifice of the Funnel, or the Conduit into the Heart, is to be ſeen againſt the *Septum*. The left *Auricle* hath exactly the ſame Structure as the right: 'Tis in the Bottom of this *Auricle*, that the Ori-

fice,

ſide, common to the two Pulmonary Veins, is to be obſerv'd, furniſh'd with two ſemi-lunar *Valves*; and againſt the *Septum* to the Right, that the Funnel or Conduit into the Heart is ſituated, joining with the Funnel of the right *Auricle*. Theſe two Conduits are ſeparated from one another by the Continuation of the *Septum*, which divides the *Auricles* to the very *Ventricle* of the Heart, and is a Support to the Middle of the double *Valve* which covers their Orifices in the Heart.

The Veſſels *of the* Heart.

It has been ſaid before, that from the *Baſis* of the Heart of the Land-Tortoiſe of *America*, there goes out four great Arteries. Of theſe, the firſt which preſents itſelf, (the Tortoiſe being turned upon it's Back) is the Pulmonary Artery: It is more on the left Side than the others, and is much bigger for the Space of an Inch: Then it divides itſelf into two Branches, the moſt apparent whereof cometh from the right Side of it's Trunk, and turns itſelf over towards the left Side, accompanying the *Aorto inferior ſiniſtra*, till it hath pierced the *Pericardium*; after that, it unites with the left Branch of the *Trachea Arteria*, which it accompanies thro' all the Extent of the left Lobe of the Lungs. The other Pulmonary Branch going out of the left Side of it's Trunk, turns itſelf over immediately croſs upon the other Arteries, from the right to the left, to join the *Aorta inferior dextra*, till it has pierced the *Pericardium*, where it joins to the right Branch of the *Trachea Arteria*, which it accompanies thro' the whole Extent of the right Lobe of the Lungs.

One Thing ſeems to me very remarkable in this Pulmonary Artery; it is this, That tho' it's Trunk, in going out of the Heart, hath more than twice the Diameter of the *Arteria Aorta ſiniſtra*, yet the two Branches which it ſends to the Lungs, have not either of them one Third of the Diameter of the *Aorta ſiniſtra*. In the Arteries, which I have fill'd with Wax, the Trunk of the Pulmonary Artery hath between ſeven and eight Lines Diameter; the *Aorta ſiniſtra* four and a half; and the Pulmonary Branches, after having pierced the *Pericardium*, have not either of them but one Line and a half Diameter: Nevertheleſs this Artery doth not produce any other Branch; all the Blood, which enters from the Heart into it's Trunk, is carried into the two Lobes of the Lungs, and no where elſe. The Reaſon of ſuch Diſproportion I cannot gueſs; but this is Matter of Fact, ſince it is the ſame in all: If I may be permitted to conjecture, it ſeems to me, that it may be attributed to the Alteration that happens to the Branches of the *Trachea Arteria*, when the Tortoiſe ſtretcheth forth his Head out of the Shell; for theſe Pulmonary Branches, making a Semicircle before they join with the *Trachea Arteria*, when the Animal's Head is drawn in, the Extenſion which happens to the Branches of the *Trachea Arteria*, when the Animal goes out of the Shell, turns theſe Semicircles into acute Angles; inſomuch, that thereby the Paſſage of the Blood is ſomewhat interrupted, and conſequently the Blood, which paſſes continually from the Heart into the Trunk, not being capable to return back, becauſe of it's Valves, muſt out of neceſſity dilate this Trunk more than the other Arteries, in which the Blood paſſes in an equal Paſſage.

And that which perſwades me, that there doth not go into the Lungs of this Animal, more Blood than that Quantity which the Pulmonary Branches can admit by their ſmall Diameter, and not the Quantity which the Diameter of their Trunk could furniſh, is, that the Pulmonary Veins, which bring back all the Blood of the Lungs into the left Auricle of the Heart, have not either of them entirely two Lines Diameter, which is very proportionable to the Bigneſs of the two Pulmonary Branches of the Arteries.

The ſecond Artery which goes out from the *Baſis* of the Heart, is that which I call *Aorta ſiniſtra:* It aſcends, as it comes out of the Heart, together with the left Pulmonary, till they have pierced the *Pericardium*; after which it makes a large Turning, without any Support, towards the left Side, which gives it the Liberty to extend itſelf when the Animal ſtretches out of it's Shell, and to refold itſelf when it retires into it: After this, this Artery deſcends againſt the Back, where it gives ſome ſmall Branches to the *Medulla Spinalis*; after that, it returns thro' the Lungs into the *Abdomen*, and it is here that it produceth a conſiderable Branch, which divides into two, of which one is diſtributed to the Liver, the Stomach, and the Inteſtines, and the other, turning towards the Right in the Middle of the *Abdomen*, unites to the *Aorta dextra*; ſo that theſe two Arteries are but one and the ſame Branch divided into two. This ſame *Aorta ſiniſtra* continues afterwards to the lower Belly, to be diſtributed to the Kidneys, Thighs, and the Parts that are below. This left *Aorta* is much longer than the Right, becauſe of the great Circle it makes when it cometh out of the Heart, to accommodate itſelf to the Motions of the Animal and to make Room for it's Head, which is placed under this Artery in the left Side, when he draws it into his Shell: And 'tis for that Reaſon that the left Branch of the *Trachea Arteria* is longer than the right. This Artery is alſo bigger than the right *Aorta*, becauſe that it furniſheth a greater Number of Parts with Blood. It hath a diſtinct Orifice into the Ventricle of the Heart, and hath not the leaſt Communication with the Pulmonary Arteries, neither in the Heart nor in any other Part. This doth not reſemble at all the *Ductus Arterioſus*, in the Heart of an human *Fœtus*.

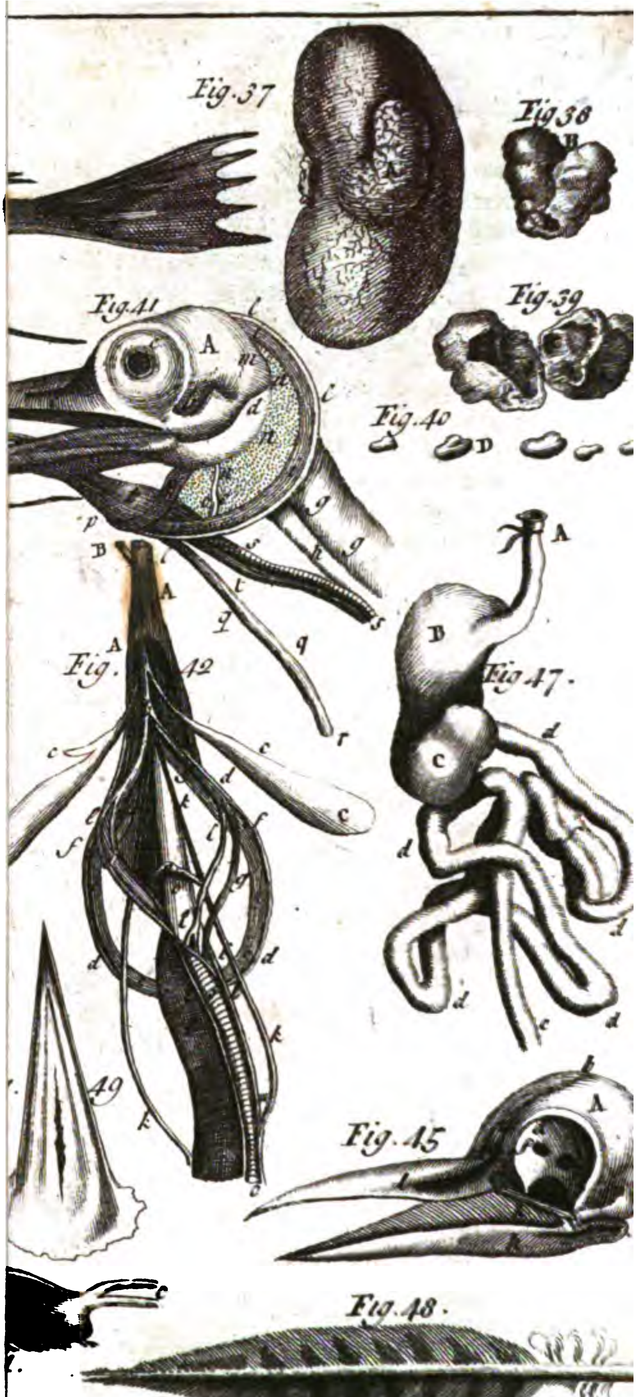
The third Artery going out from the *Baſis* of the Heart of this Animal, is that which I call *Aorta deſcendens dextra*. After having pierced the *Pericardium*, it ſinks towards the Back; then returning thro' the Lungs into the *Abdomen*, where it receives the Branch of the *Aorta ſiniſtra*, it is diſtributed to the Right Kidney, Thighs, Bladder, and Parts of Generation: So that I call theſe two Arteries, *Arteriæ Aortæ deſcendentes*, becauſe they diſtribute the Blood to all the inferior Parts of this Animal, the ſame as the *Aorta deſcendens* doth in all other Animals.

The fourth Artery going out from the Heart, is the *Aorta aſcendens*: It hath an Orifice in the Ventricle of the Heart, common with the *Aorta deſcendens dextra*: It appears in part under the *Aorta ſiniſtra* coming out of the Heart, and aſcendeth in a ſtraight Line till it hath pierced the *Pericardium*; after which it divideth into three principal Branches, whereof the two lateral go to the fore Legs, and make the Carotid; the third aſcends all along the *Trachea Arteria* towards the *Larynx*, and gives Branches to all the Parts of the Neck.

The Diſpoſition of the Arteries which go out of the Heart being examined, there remain only the Veins which bring the Blood into it from all the Parts of the Animal: But firſt it is to be obſerved, that there are no Veins which terminate in the Heart; for all the Veins open themſelves into the Auricles, which are, as hath been ſaid, ſeparated from the Heart.

There are two Ways to ſhew theſe Veins without Diſſection: The firſt is to fill them with Wax, by ſyringing it into them by their Orifices in their Auricles; for if one ſyringes by the oblong Orifice in the *Auricula dextra*, all the Veins of the Body (except thoſe of the Lungs) will be entirely fill'd; and afterwards by ſyringing into the oval Orifice in the *Auricula ſiniſtra*, the two Veins of the Lungs will be full at once through the whole Extent of the *Trachea Arteria* in the Lungs.

The other Way is to wait till the Animal is expired; becauſe the Heart loſing inſenſibly it's Vigour, (it beating for the Space of 24 Hours) it has not then the Force to diſcharge itſelf of the Blood which comes from all Parts into theſe Veins, which then grow very turgid by the coagulated Blood collected in them: then you need only to turn over the Heart towards the Neck, cutting only the little Coronary Vein which comes out of the Subſtance of the Heart, to obſerve all the great Veins without Diſſection: becauſe they all come and end in a common Reſervatory, ſituated acroſs in the Capacity of the *Pericardium*, joining to the Auricles. And here one may obſerve a great Vein, or an irregular Reſervatory: In the Tortoiſes I have diſſected of 18 or 20 Inches long, this Reſervatory was 10 Inches broad, and 18 Inches long. In this Reſervatory the two Axillary Veins which come from the upper Parts of the Body, join one another, after having pierced the *Pericardium*, one on the Right Side, and the other on the Left. From the inferior Parts there join two large Veins, one on the Right Side, and the other on the Left of the inferior Part of this Reſervatory; the firſt whereof is made up of all the Branches which come out of the Right Lobe of the Liver, which is very big; and the other conſiſts not only of the Veins of the Left Lobe of the Liver, but alſo of a Vein which ſupplies the Place of the *Vena Cava*, and which I call the *Vena inteſtinalis*, becauſe after it has received all the veins of the inferior Parts of the Animal, it runs all along the Inteſtines, from which it receives the Veins; and being



J. Harris Sculp.

arrived at the *Pylorus*, it paſſes croſs the left Lobe of the Liver, and terminates in the common Reſervatory.

Beſides theſe four great Veins, there are three, and ſometimes but two, coming from the middle part of the Liver, which are inſerted into the Bottom of the Reſervatory; as alſo the little Coronary Vein from the Heart.

All theſe Veins being thus re-united in one common Place, this Reſervatory terminates upwards in a Conduit, which is inſerted into the poſterior Part of the Right Auricle, and opens into it's Cavity by an oblong Orifice, furniſhed with two long Semilunar Valves, which permit the Blood of the Reſervatory to enter into the Auricles, but hinder it's returning from the Auricles into the Reſervatory.

A little above the Reſervatory, under the Left Auricle, the two Pulmonary Veins are ſeen: The Left, after having entered the *Pericardium*, is hid under the Axillary Vein, and does not ſeparate itſelf from it but a little above the Auricles; from thence it bends to go and inſert itſelf into the poſterior Part of the Auricles. The Right Pulmonary Vein follows after the ſame manner the Right Axillary, which it quits after it has enter'd the *Pericardium*, to traverſe almoſt all the Length of the Reſervatory, and meet the Left Pulmonary about two Lines diſtance from the Auricles. Theſe two Veins thus united, open themſelves in the poſterior Part of the *Auricula ſiniſtra*, by a common Oval Orifice furniſhed with two Semilunar Valves; by which means they pour into this Auricle all the Blood that comes from the Lungs to the Heart.

By all that has been obſerved concerning the Structure of the Heart of the Land-Tortoiſe of *America*, and the Diſpoſition of both it's Auricles and Veſſels, how extraordinary ſoever it may appear, it is impoſſible to find out the leaſt thing which may injure the Opinion of Dr *Harvey*, and all other Anatomiſts, about the manner that the Blood circulates in the Heart of an human *Fœtus*, and the Uſe of the Valve which is at the *Foramen Ovale*; which is, to permit the Blood to paſs from the Right Auricle thro' this Hole into the Left, and to hinder the Blood's paſſing from the Left Auricle by this Hole into the Right. And I add further, that amongſt all the known Animals, one could not chuſe one whoſe Heart may be more proper to confirm this Opinion, than the Land-Tortoiſe of *America*, by reaſon of the Simplicity of it's Structure, and of the plain and diſtinct Manner in which all the Parts appear. Therefore if Mr *Mery* will give himſelf the trouble to examine a ſecond time the Structure of the Heart of this Animal, he muſt acknowledge his Miſtake and Errors.

Fig. 56.] *a, a, a, The Heart. b, b, b, It's Auricles. c, The Trunk of the Pulmonary Artery. d, The* Arteria Aorta deſcendens ſiniſtra. *E, The* Arteria Aorta ſuperior. *H, The* Arteria Aorta deſcendens dextra. Fig. 56.

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Fig. 56.] *a, a, a, The Heart. b, b, b, It's Auricles. c, The Trunk of the Pulmonary Artery. d, The* Arteria Aorta deſcendens ſiniſtra. *E, The* Arteria Aorta ſuperior. *H, The* Arteria Aorta deſcendens dextra. Fig. 56.

F, *The Ligament that suſpendeth the Cone of the Heart in the* Pericardium, *G, G, G, G, G, The* Pericardium *opened.*

Fig. 57. *Fig.* 57.] *a, a, a, The Heart opened to ſhew the Parts of it's Ventricles, b, The double Valve covering the Orifices of the* Ductus's *from the Auricles. c, The Orifice of the Right Auricle i. d, That of the left H. e. The Orifice of the* Arteria Pulmonalis K. *f, That of the* Aorta ſiniſtra L. *g, The Orifice common to both the* Arteria Aorta dextra M, *and the* Aorta ſuperior N.

Fig. 58. *Fig.* 58.] *a, a, a, The Auricles. b, The Right Auricle. c, The Left Auricle. d, d, The Muſculous* Septum *that divides the Cavities of the Auricles. E, The Orifice of the Reſervoir of the Veins. F, The Orifice of the Pulmonary Veins. g, g, The large Parts of the Funnels. H, The Muſculous* Ductus *of the Funnels. i, i, The Reſervoir of the Veins. K, The Left Axillary Vein. L, The Right Axillary Vein. M, The great* Inteſtinal *Vein. N, The great Hepatic Vein. o, o, The two ſmall* Hepatic *Veins. P, The Right Pulmonary Vein. q, The left Pulmonary Vein.*

Fig. 59. *Fig.* 59.] *a, The Heart of the Tortoiſe. b, The Trunk of the* Arteria Pulmonalis. *c, c, c, c, c, The Branches of the* Arteria Pulmonalis *accompanying the* Bronchia *in the Lungs. d, d, d, d, The* Arteria Aorta deſcendens ſiniſtra. *e, e, e, e,* Arteria Aorta deſcendens dextra. *f, f, One Branch of the* Aorta ſiniſtra, *which communicates with the* Aorta dextra. *g, g,* Arteria Inteſtinalis. *h,* Arteria Aorta ſuperior, *or* Aſcendens. *i, The* Ligament *that ſuſpends the Heart. K, The* Trachea Arteria, *L, L, L, L,* &c. *The two Branches of the* Trachea Arteria *going to the Lungs.*

The Anatomy *of an* Elephant. *By Mr* P. Blair. n. 326, *p.* 51. n. 327, *p.* 117. n. 358, *p.* 885.

XXIII. After this Animal had travell'd moſt Part of *Europe*, ſhe came at laſt to *Scotland*, where after ſome Stay at *Edinburgh*, they conducted her to the *North*, and by long and continued Marches haſten'd to *Dundee* in their Return; the Beaſt, much fatigued, fell down within a Mile of *Dundee*: After many Endeavours (which prov'd ineffectual) to get her upon her Feet again, they digg'd a deep Ditch, to the Side of which ſhe might lean to reſt herſelf; but ſoon afterwards there fell great Rains; ſo that after lying a whole Day in Water, ſhe died the next Morning, being *Saturday* the 27th of *April*, 1706.

The Animal lying in the open Fields, the great Heat of the Day, the Croud of People, the Time the Butchers took the flaying off the Skin, and the Shortneſs of the Time, being the laſt Day of the Week, makes this Diſcourſe ſo imperfect. I had ſcarce any Time or Convenience ſo much as to ſee any thing of Moment, much leſs to enquire ſo nicely as the Subject requir'd. I examin'd, as well as I could, the Muſcles of the *Proboſcis*, view'd the Situation of the *Viſcera*, took the Figure and Dimenſions of the Liver, extracted the *Uterus* *ras* and *Bladder*, and caus'd the Head to be cut off, which (with ſome other Parts I deſigned to have diſſected) were brought to *Dundee*. On *Monday* I went to examine the *Inteſtines*, *Spleen*, and *Kidneys*; but the *Inteſtines* were dried, and their Figure and Structure quite ſpoiled by the Heat: The Time I deſign'd to have beſtow'd in diſſecting the Parts I had reſerv'd (which would not keep becauſe of the Heat) was taken up in excarnating, boiling, and taking care of the *Bones*: of which I ſhall give a full and exact Account, and as good a one of the *Internal* Parts, as the before mentioned Difficulties would permit. I ſhall firſt obſerve only, that the *Epiphyſes* in this Subject ſeparated from the *Bones* by boiling, as eaſily as thoſe of an Human Subject would have done at the Age of 10 or 12; and yet the Keeper told me, ſhe was 26 or 28 Years old; which is an Argument for the long Life of this Animal, which ſome ſay lives to 120 Years, others to 200, ſome to 300; nay, there are ſome who affirm they can live to 500 Years. I have nothing to ſay for the Truth of theſe Aſſertions.

The external Shape *of the* Elephant.

I ſhall firſt take Notice of the external Shape and Dimenſions, and then of the internal Parts and their Structure. That it is *Animal Vaſtiſſimum*, I agree with *Franzius*; but that it is deform'd, ſince thoſe due Proportions laid down by the Author of Nature are as well obſerv'd in this as in any other Animal, I can hardly grant; for nothing can be deform'd but what ſwerves from a general Rule. It has a big ſhort Head, ſhort Neck, long Noſe or *Proboſcis* hanging almoſt to the Ground; a Back ſomewhat protuberant, a ſhort and round Body, a long Tail, four great round Legs, like ſo many Columns ſupporting ſuch a vaſt Weight; and ſhort Feet, thoſe before being broader and rounder, and thoſe behind more long and narrow, each ſhod with 4 Hoofs; a little narrow Mouth, with two long Tusks proceeding from the Upper Jaw, one on each ſide of the *Proboſcis*; 4 ſtrong Grinders in each Jaw; ſmall, yet piercing Eyes; and large flat Ears.

The Particular Dimenſions *of the ſtuff'd* Skin.

Fig. 60.

The Dimenſions are as follow: At the fore Leg ſhe was 8 ½ Foot high (A. A.) and 9 at the hind (B. B.) in Length 10 Foot (C. C.) and a Tail 4 Foot 3 Inches long (C. D.) round the Belly 14 Foot (E. E.) from the Top of the Head to the End of the *Proboſcis* 8 Foot (F. F.) whereof the *Proboſcis* makes up 4 ½ Foot (F. G.) from the Forehead equal with the Eye to the lower Jaw, meaſuring backward, 27 Inches (H. H.) from the Top of the Head to the lower Jaw, meaſuring downward, 4 ½ Foot (F. I.) The Ear was almoſt ſquare in this Subject, and ſmall in reſpect of thoſe other Animals. Whether or not this Difference might have been in regard of the Sex, I know not. 'Twas in Length 19 Inches (K. K.) and in Breadth 17 (L. L.) The Eye (U) was not ſo ſmall as Dr *Moulins* would have it; who ſays, they were no bigger in the Subject he treats of than thoſe of a Sheep; whereas in this they are larger than thoſe of an Ox. The Diſtance betwixt them, meaſuring acroſs, was 26 Inches; between the *Anus* and *Vagina* 2 $\frac{1}{2}$ Foot; between the Dugs 1 Foot: The fore Foot meaſuring round the Extremities of the 4 Hoofs, 3 Foot 10 $\frac{1}{2}$ Inches (N. N.) whereof the external Hoof running obliquely forward was five Inches; the ſecond on the outſide, ſquare before, was 5 Inches and 6 in Breadth, *i. e.* up toward the Skin; as was the third ſquare alſo before, and 4 $\frac{1}{2}$ Inches *(c)*. The Internal was more pointed than the External, and of the ſame Length; the hind Part of the Foot was cover'd with a tough thick Skin: The Diameter of the fore Foot, from the Right to the Left, was 14 $\frac{1}{2}$ Inches; from before to behind, 16 $\frac{1}{2}$ Inches. The Circumference of the fore Leg, at the upper Joint, was 4 Foot 3 Inches (O. O.) At the Articulation of the *Carpus* 2 Foot 6 $\frac{1}{2}$ Inches (P. P.) the Circumference of the hind Foot round the Hoof, 3 Foot 4 Inches (Q. Q.) It's Diameter from behind to before, 16 $\frac{1}{2}$ Inches; from the Right to the Left, 12 Inches. The Breadth of the outer Hoof, 4 $\frac{1}{2}$ Inches *(b)*; the fore Hoof being Semicircular, 3 $\frac{1}{2}$ Inches, *(a)* the third and fourth Hoof 4 Inches each; both inner and outer Hoof go obliquely forward. The Circumference of the hind Leg is 2 Foot 3 Inches, (R. R.) Theſe are the Dimenſions of all it's external Parts, taken either from the Body, when it lay dead in the Field, or ſince from the ſtuff'd Skin, wherein for the moſt part they agree; only that by reaſon of drying, the Legs are ſmaller, and the Back not ſo protuberant.

The Cuticula *and* Cutis.

As to the *Cuticula* and *Cutis*, Dr. *Moulins* has already at large inſiſted moſt judiciouſly on both, and indeed he had good Opportunity to do ſo; for he had the Choice of any Part of the Skin he pleas'd, (to view it's Structure) that was not defac'd by the Fire; whereas I had not an Opportunity of making Trial of any of it green; what Accounts I can give are taken from it, as it now ſtands dry. I ſhall tranſcribe what of Dr *Moulins*'s Account I find agreeable to that I ſee in this Subject, and add my own Obſervations.

Dr Moulins'*s Account of the* Scabs.

He ſays, 'He found the *Cuticula* cover'd all over with a ſtrange ſort 'of Scab, in many Places reſembling old Warts, deeply jagged, and 'the carnous Fibres of the Muſcles of Beef when much boil'd and 'tranſverſly cut, but of a dirty tawny Colour. Theſe Scabs (if they 'may be ſo called) both ſlit and look like ſhort Pieces of Whale-bone; 'they did ſo firmly ſtick to the *Cuticula*, that they could not be pluck'd 'from it, nor the Parts of which they conſiſted (tho' they were much 'divided) from one another, without tearing it, and yet the *Cuticula* 'was very tough and thick.

The Length *in his Subject.*

This is very lively expreſs'd, and anſwers exactly to what I find in this Subject. He goes on, and ſays: 'The Length of theſe Scabs 'was in ſome above $\frac{1}{3}$ or $\frac{1}{4}$, but in other Places not above $\frac{1}{10}$ or $\frac{1}{12}$ of 'an Inch. The Cauſe of which Difference he takes to be the *Elephant*'s 'wearing, by rubbing or lying, ſome Parts of them, while others were 'ſlightly, or not at all worn.'

The

In ours. Fig. 91, 92.

The Scabs of this Subject were not ſo long: for as the deepeſt I could find upon the *Cuticula* was not above $\frac{1}{2}$, ſo the thinneſt was leſs than $\frac{1}{16}$ of an Inch; but that is not material. As to his Reaſon why they are thicker in ſome Parts than another, tho' it may ſeem pretty good, yet I ſhall offer another by and by, as a no leſs probable Conjecture.

The Hairs *in his.*

He ſays, 'He could find but very few Hairs without this Scab, 'but many within, and even with it. The *Elephant*'s Inclination to 'itch, and to rub himſelf againſt whatever came in his way, kept 'thoſe Hairs that were even with the outſide of the aforeſaid Scab, 'from appearing of any conſiderable Length. The Hardineſs of the 'Scab, keeping the Roots of the Hairs faſt, did very much contribute 'to their wearing on the outſide, as well as to their Preſervation on 'that within.'

In ours.

In our Subject the Hairs are every where pretty long, ſome 2, ſome 3 Inches; (others in Places moſt ſubject to rubbing, as the Doctor obſerves) but 1 $\frac{1}{2}$ Inch, though indeed not ſo numerous as I find. There are Paſſages for them thro' the *Cuticula*. I know not what the Doctor means by diſtinguiſhing between thoſe found in the *Cutis*, and thoſe in the *Cuticula*, ſince I am convinc'd all ariſe from the *Cutis*, and penetrate the *Cuticula*. They are indeed black, and many of them ſtiffer and thicker than thoſe in an Hog. As he by the Fire had occaſion to obſerve ſome Pieces of the *Cuticula*, rais'd from the *Cutis*, ſo the Skin of this Subject is in many Places depriv'd of it, eſpecially where the Beaſt lay moſt in the Water at it's Death; and ſince theſe are means whereby to ſeparate the one from the other, this may give occaſion to enquire by what Means they adhere: But I muſt firſt conſider the Structure of the *Cuticula*, and then of the *Cutis*. You know ſome have taken the *Cuticula* to be nothing but a certain Cruſt form'd of ſeveral Mucilaginous Particles, obducing the *Cutis*, &c. in the *Uterus*; which after the *Fœtus* is come to greater Maturity, is condens'd and form'd into a Skin, ſuch as we ſee *Mucilages* and *Pultiſes* have, when after boiling they are expoſed to the Cold: Others, that the *Cuticula*, as well as *Cutis*, is compos'd of a *Congeries* of *Membranous Fibres*, intermix'd with a great many *Capillaries*, and endued with Pores fit for Perſpiration: And there are Anatomiſts who aſſert, they have injected theſe Cutaneous Veſſels in the *Cuticula* of a *Fœtus*, as well as in the *Cutis*; tho' when the Animal is more adult, theſe *Capillaries* not only eſcape the View of the naked Eye, but even of Opticks. That this has been the Structure of the *Cuticula* in this Animal is moſt plain and obvious; for tho' I cannot determine it's Thickneſs, as Dr *Moulins* might have done in a recent one, yet now as it is dry, it ſeems to be of the Thickneſs of, or rather thicker than you ſee common Vellum, with it's inner Surface excavated, as a Woman's Thimble, (the Holes being much about the ſame Bigneſs, and diſpos'd regularly) or in an Honey-Comb. Among the Interſtices

The Structure of the Cuticula.

The Cauſe *of the* Scabs.

Fig. 91. of theſe Excavations, the Ramifications and Divarications of the Blood Veſſels are obvious. At every two Lines or $\frac{1}{6}$ of an Inch diſtance, for the moſt Part are to be obſerv'd Protuberances compos'd of 5, 6, or 7 Columns joining, and making up a Pyramid or Cone; in the Top whereof is the *Pore* or *Ductus*, mention'd by Dr *Moulins*, through which the Hairs paſs; they are nothing but the Interſtices of the *Favi*, or Depreſſions, which ariſe in the *Cuticula*, and are impacted in the *Cutis*, for the better Reception of the Hair And 'tis probable, that all the Hairs are cover'd over with thin Membranes, as Dr *Moulins* obſerves, from the Extremity of their Roots to the *Cuticula*; becauſe having pulled out ſeveral of the Hairs, I ſaw them included within their proper *Involucra*, and doubt not but it was ſo with all the reſt too, beſide the common one which is both contiguous and continuous to the *Cuticula*. The Hairs are more looſe, and the Pores more patulent and obvious in the *Cuticula* now dryed, than I ſuppoſe they were when recent; but whether theſe Pores were alſo deſigned for Separation of Vapours by Perſpiration, or only to contain and convey the Hairs planted in the *Cutis* through the *Cuticula*, is what I ſhall neither contradict nor affirm. To the outſide of this *Cuticula* adhere the Scabs, which I rather take to be a ſupervenient Diſtemper incident to this Animal, when out of it's own Climate, occaſion'd by the Conſtruction of the Pores from Cold, than any wiſe natural to it: And to this the Accounts of all Authors agree; who tell us, that there are two kinds of them, one of a more dark Colour, and another duſkiſh and ſad, having both their Skins of a very ſmooth and polite Surface; wherefore the Keepers of this *Elephant* with us, call'd it the *White Elephant*, in oppoſition to the black ones; whereof *Horace* ſays, *Nigris digniſſima Barris*: But after they are affected with the Scab, this Diſtinction of Colours is not obſerv'd. Authors tells us, that the firſt Thing they do when they begin to tame them, is to anoint them with Oyl, whereby they keep their Skin ſmooth, ſoft and flexible, and relax their Pores ſo, that whatever groſs Particles may fly off from their Blood, whoſe Conſtitution is now, perhaps, worſe by the Alteration of Diet, and Hardſhips they undergo at taming, may not ſtick to the Skin, but be freely evaporated. And I am credibly inform'd, by ſuch as have lived long in the *Indies*, that they take as much Care to keep the Skins of the *Elephants* ſmooth and clear, as we do with our fine Horſes. Since then theſe Scabs are a Diſeaſe, and not natural to the Animal, it is reaſonable I ſhould enquire into the Cauſe of them; which to me ſeems to be *à Craſſitie & Viſcoſitate Sanguinis*, whoſe Particles, becauſe of obſtructed Pores, by a Cold too exceſſive for their Body, do not ſo eaſily fly off; but after they have paſs'd the *Cuticula*, go no farther than it's Surface; and becauſe of the *Viſcoſity* of their Texture, do ſo cleave to, and heap upon one another, that they appear under the Form of a Scab; which by the Evaporation of the humid Particles,

cles, harden by Degrees, and by the Heat of the Sun are cracked, rent, and divided. That Coldneſs of the Weather will occaſion groſs and viſcous Blood, there's none acquainted with the Diſtempers in theſe Northern Countries will readily deny; nor that moſt of theſe Diſtempers proceed from the Obſtructions of *Capillaries* and *Pores*: And that this may be the Cauſe of theſe Scabs, I offer only this one Experiment; whatever Pieces of the *Cuticula* I obſerv'd where the Scabs were thin, there the *Favi* or Depreſſions were large and conſpicuous; but where they were very thick, there the *Favi* were very ſmall, and almoſt imperceptible; which plainly implies, that where-ever theſe Particles avolate freely, few adhere to the Surface of the Skin; but when their Force is inhibited by the Straitneſs of the Pores, they are unable to remove any further than they adhere to, and augment the *Moles* of the Scab. Theſe are divided from one another by ſeveral *Rimæ*, or Rents, which may either be occaſioned by the afore-mentioned Heat of the Sun, or by the different Poſture the Skin is put in by the ſeveral Motions of the Body. Hence it is, that where the Skin is moſt wrinkled, theſe *Rimæ* are moſt frequent. It may be ſaid that this Reaſoning ſeems to contradict what Dr *Moulins* has aſſerted, *viz.* That this Animal has a very ſubtile Blood, abounding with a penetrating urinous Salt; which he proves from the Vivacity of the Species, from the urinous *Effluvia* which affected his Noſtrils, and from the ſmarting of his Finger by the Blood, after it was cut. As to the firſt, that it is a very vivacious and ſpirituous Animal, both the foregoing Relation and the Account of all Authors make it apparent; but that does not hinder it's Blood from being incraſſated by Cold and bad Diet, nor that theſe Scabs may proceed from this groſs Blood. As to the ſecond, tho' he might have been ſenſible of an abounding urinous Salt in that Animal, it doth not follow it ſhould be ſo in all, and I am apt to believe it was extraordinary; for without doubt ſuch a Burning as the poor Beaſt underwent, even to it's Death, muſt have alter'd the Conſtitution of it's Blood, and make it quite different from what it was; and 'tis probable, that it was at ſuch Places as were moſt affected with the Burning, where he found this urinous Smell, and the ſmarting of his Finger. For my part, I obſerved the Blood of this Subject to be Styptick and Reſtringent: So that when my Hands were imbru'd in it, I could ſcarce bend a Finger; which Effect I have alſo perceived at the Diſſection of Fiſhes, which all acknowledge to have viſcous Blood. But it may be objected, that this our Subject ing *Morbid*, and of a languiſhing Diſtemper, the Blood of the one ight be groſs and viſcous, and yet that of the other ſpirituous and tile: I ſhould be ready to acknowledge the Objection to be valid, I did not underſtand both were affected with the ſame Scab, and what appears, the other ſeems to have been more than this.

The Scabs divided into *everal* Rimæ.

The Conſtitution of the Elephant's *Blood.*

I proceed to the *Cutis*, whoſe inner Surface Dr *Moulins* obrv'd, 'To abound with a great many Glands: When cut through, at

'leaſt

The Structure of the Cutis.

‘ leaſt as far as the Roots of the Hair went, it was like the horny or callous Part of Brawn, and it's outer Surface abounded with a great many *Papillæ*.’ I had not Opportunity to obſerve any of theſe; but am apt to believe all to be true: And firſt, as to the *Papillæ*, I told you already, that the *Cuticula* was endued with a vaſt Quantity of *Favi*, or Depreſſions, wherein I doubt not but theſe *Papillæ* were receiv'd, tho' the Surface of the *Cutis*, as now dry'd, is ſmooth; and where the *Papillæ* ſeem'd to have formerly been, there are now rather Depreſſions than Protuberances. This is an Argument that there has been ſome kind of Liquor contain'd in theſe *Papillæ* or Veſſels, as I may call them, which at the drying of the Skin are evaporated; and therefore I ſuppoſe this brawny Part of the *Cutis* to be a *Congeries* of *Ductus Excretorii*, running in a parallel Line from theſe Glands to the Veſicles, and conveying the Liquor to be contain'd in them, till it be evaporated by Perſpiration; and theſe Veſſels ſeem to have been both ſo big and numerous in this Animal, that they make up at leaſt two Parts of the inner Surface of the *Cuticula*; the Blood Veſſels and the Depreſſions together, ſcarce make up a third Part. They ſeem alſo to be lodg'd in the *Cutis* by one half, and in the *Cuticula* by the other; for in ſome Places of the *Cutis*, I obſerv'd the Depreſſions as numerous and ſeemingly parallel to thoſe in the *Cuticula*; and that, notwithſtanding the *Membranulæ*, where the Humour was included, which now being dry'd and collaps'd, may take up ſome Space in the Depreſſion of the *Cutis*. By this Account both of the *Cuticula* and *Cutis*, I come to enquire, Firſt, how the one ſhould ſo firmly adhere to the other, when there ſeems to be no Communication by Fibres betwixt them, as appears by their eaſy Separation both by Fire and Water: Secondly, How conſiderable the Perſpiration may be. As to the Firſt, Since the *Cutis* and *Cuticula* are two diſtinct Membranes, their Coheſion ſeems to be mutual: Firſt, theſe Pyramids, which receive the Hairs, are impacted in the *Cutis*, and cloſely ſurround their Roots; and then theſe *Papillæ* are impacted in the *Cuticula*, which ſo long as they are diſtended with the Humour fit for Perſpiration, will not readily quit the Depreſſions in the *Cuticula*, unleſs the Humour be ſuddenly evaporated by Fire, or the Sides of theſe Depreſſions or *Cellulæ* be relax'd by Water; and there may be a certain Viſcoſity, which obduces the Surface of both, as it were ſo much Glue, which either the Fire may dry up too much, or the Water dilate; ſo that the one can be ſoon ſeparated from the other, and the Hairs either be pulled from their Place, or quit their common *Involucrum*. As to the ſecond, *viz.* The Perſpiration, I ſhall offer no other Calculation than what is already made by Dr *Moulins*, He ſays, ‘ The Pores muſt be both numerous and large for Perſpiration, eſpecially if we conſider *Sanctorius* his Statical Obſervations of a Man's inſenſible perſpiring in a

‘ Winter's Day ℥ 50. and upwards; which is ſomething more than $\frac{1}{54}$ ‘ of an ordinary Man's Weight, ſuppoſing him to be 170 lb. and at ‘ this Rate we muſt ſuppoſe an *Elephant*'s Perſpiration to be vaſtly ‘ more; but (as he ſays) 'tis probable, the Scabs might bar it from ‘ bearing Proportion to that of a Man's:' So that whatever the *Elephant* might have perſpir'd in an healthy State, we may reaſonably ſuppoſe it to do much leſs, when attacked with this Diſeaſe; which may be another Argument for the *Craſſities Viſcoſitas Sanguinis*, wherewith I alledg'd this Animal I diſſected was endued.

I can determine nothing about the Thickneſs of the Skin, while recent; but as it is dry, by an Inciſion made upon one of the Hips, it appears to be leſs than ¼ Inch, and of Subſtance not unlike to *Engliſh* Bend or Sole-Leather.

The cutaneous Veſſels.

I had no Opportunity to obſerve, whether there were any cutaneous Veſſels, but doubt not but there have been of them, and that in abundance; 1. From the numerous *Glands* diſpers'd all over it's inner Surface, which muſt have Blood-Veſſels inſerted in them: And, 2. From the abundance of *Ramifications* diſpers'd in the *Cuticula*, proportionable to which, it is probable, they were alſo in the *Cutis*.

Panniculus Carnoſus.

I can ſay nothing about the *Panniculus Carnoſus*, neither am I fully convinced of what is related by Dr *Moulins, viz.* That this Animal kills the Flies, by putting itſelf ſuddenly in a Poſture to wrinkle the Skin on that Side that is attacked by them; ſo that the Cracks are forced cloſe together, and the Flies bruis'd; for 'tis hard to conceive ſuch a big Animal ſhould all on a ſudden be ſo nimble. I rather believe, that the *Proboſcis* from before, and the Tail from behind, may ſupply the Defect of the *Panniculus Carnoſus* (if it be wanting): For if we conſider the Length of each, we ſhall find they come near to meet about the Middle; for the Body of this Subject being 10 Foot in Length, the *Proboſcis* and Tail make up between them near 9 of it; and what is wanting, the Air, by the Force of their Motion, is enough to expel the Flies, even when without their Reach.

Fat.

As to the *Fat*, whether by Reaſon of the extraordinary Leanneſs of this Subject, or if it be ordinary for *Elephants* to be endued with but little of it, I know not; but I could not have believed ſo little Fat to have been in any Animal as was here; for beſide that there was neither a *Membrana Adipoſa*, or conſpicuous *Omentum*, there was not one Grain of Fat, either among the Interſtices of the Muſcles ſurrounding the Kidneys, nor round the *Anus* and *Vagina*, where 'tis uſually found; and, what is more, when I had ſpent near a whole Day in boiling the Bones in a Dyer's Veſſel, without changing the Water, except that I ſupplied what was evaporated, there was not ſo much as a Drop of Oil that did ſwim upon the Liquor.

Dr Moulins's *Account of the* Membrana Nervoſa.

Dr *Moulins* takes notice of a very ſtrong nervous Membrane, (which I confeſs I had not Time to remark, and therefore I give it in his own Words) which obliquely deſcended from the *Spina Dorſi* to the *Sternum* and *Linea Alba.* ‘ This Membrane was very tough, and ‘ near as hard to be cut as Whalebone of the ſame Thickneſs; which ‘ all along the Back, was about $\frac{1}{6}$ Inch, but nearer the End I tried it, ‘ the thinner I found it. This Membrane ſeem'd to terminate in the ‘ *Linea Alba*, as the Tendons of the Muſcles of the *Abdomen* uſually ‘ do. It's nervous Fibres are very diſtinguiſhable, and might eaſily ‘ be ſeparated throughout their whole Length. This, doubtleſs, was ‘ to ſtrengthen the Creature, and, perhaps, that the Weight of the ‘ *Viſcera* contain'd in the *Abdomen* ſhould not diſtend the *Peritonæum* ‘ and Muſcles adjoining, ſo as to let them hang lower than was con‘venient.’ A like Piece of Mechaniſm I have obſerv'd in the Diſſection of a *Porpoiſe.*

The Muſcles *of the* Proboſcis.

After the Skin was wholly remov'd, there being no Time to examine all the Muſcles of this huge Body, I applied myſelf particularly to thoſe of the *Proboſcis.* Wherefore the Body being ſupine, I firſt conſider'd the Neck, and Upper or Fore-part of the *Sternum*, where I obſerv'd two Pair of Muſcles to ariſe ſharp and fleſhy; whereof two in the Middle, from a ſmall Origin, were extended into large Muſcles, running ſtreight forward, and diſtinguiſhed from each other by a white Line, till they came to the Point of the lower Jaw; their other Side running obliquely outward, till they came over-againſt the Articulation of the lower Jaw with the Upper: From thence keeping the lower Part of the lower Jaw, they return'd to the aforeſaid Point, in Figure not unlike the *Cucullaries* in human Subjects, with their Fibres running obliquely forward from this middle Line toward their external Part. This Pair ſerv'd to draw back the lower Jaw, and like the *Platyſma Myoides*, cover'd all it's other Muſcles, with thoſe of the *Larynx*, Tongue, and *Pharynx.* On the Outſide of this Pair aroſe two other Muſcles, ſmall at their Beginning, and in their Progreſs paſſing in betwixt the *Os Zygomaticum* and Skull, adhering to the *Muſculus Temporalis*, and aſcending, run up below the *Meatus Auditorius*, half way betwixt the Orbit of the Eye and Top of the Head; where becoming very thick and round, it paſs'd over a ſharp Angle of the Skull toward the Forehead; whence deſcending from above the Eye, it came, and with it's Partner fill'd up that Hollowneſs of the *Os Palati (k)*, and coming ſtill lower, made up the back Part of the Trunk or *Proboſcis.* Afterwards the Body being turn'd over, I had Opportunity to ſee the *Tax-Wax* mention'd by Dr *Moulins*; which ariſes from a *Spina* in the back Part of the Skull *(c)*, whence running backward along the Sides of the ſeven *Vertebræ* of the Neck, it terminated betwixt the 6th and 7th *Vertebræ* of the Back, becoming ſtill thinner in it's Progreſs. It was about ſix Inches broad, pretty thick, and deſcended obliquely from the Top of the *Spinæ Vertebrarum* to above the Ribs, and cover'd all the Muſcles which ariſe from the Neck, and ſupport the Head; aſſiſting them, (as Dr *Moulins* rightly obſerves) becauſe the Heads of Quadrupeds, eſpecially of this Animal, being more pendent, have more need

Retractores Proboſcidis.

Fig. 62.

Tax-Wax.

Fig. 67.

need of Supporters than the Head of a Man, where this Contrivance is wanting. Dr *Moulins* tells us, that it was placed edgways; the Reaſon of which may be, becauſe of the *Spines* of the four laſt *Vertebræ* of the Back, which are four Inches broad; whence the *Tax-Wax*, running forward (where the Spines are narrow, or where there are no Spines at all, as in the three firſt *Vertebræ* of the Neck) in a ſtraight Line to the Skull, the Space below it for the Muſcles to move in muſt be the ſame at the Neck as at the *Spina*, where the *Epiphyſes* keep their upper Sides at ſuch a Diſtance. From above this *Tax-Wax* in Elevatores. the Neck, do ariſe two Muſcles, thinner and narrower at firſt, but Proboſcidis. thicker and broader as they go to the Skull, where they firmly adhere to the Sides of a large *Sinus* in it's back Part *(b)*, whence aſcending, Fig. 67. being lodg'd in the Depreſſion upon the Top of the Head, and betwixt the Eminences *(d d)* they deſcend till they come over againſt Fig. 62. the Hole for the Root of the Trunk *(a)*, and become thicker and round, and in their whole Deſcent make up the Fore-part of the Trunk with the Extremity.

Thus then the *Proboſcis* is compos'd of two Pair of Muſcles; one whereof makes up it's Back-part, which ariſes from the *Sternum*, and paſſes with ſtraight Fibres in below the *Os Zygomaticum*; and from thenceforward, 'till it makes up the Body of the Trunk itſelf. Another Pair, which, ariſing from the Neck, paſſes over the Head, and deſcending makes up it's Fore-part. The Fibres of this Muſcle deſcend in a ſtraight Line, till they make up the Body of the Trunk, and then begins a ſtrong tendinous Interſtice, by which they are ſeparated from their Copartners; whence their Fibres deſcend obliquely to another ſtrong Interſtice, by which on each Side they are ſeparated from their Antagoniſts, where the ſame oblique Courſe of Fibres is again to be obſerv'd, that is to ſay, that the *Erectores Proboſcidis*, (for ſo we may call theſe which make up the Fore-part of the *Proboſcis*) (*g g*) unite in a tendinous Interſtice (*b*), from whence the Fibres on each Side obliquely Fig. 88. deſcend: So likewiſe the *Retractores Proboſcidis*, for ſo we may call theſe which make up the Back-part of the *Proboſcis*, have their tendinous Interſtices running down the Middle of it's Back-part; from whence the Fibres obliquely deſcend, almoſt making an Angle of a *Demirhombus* on each Side in another longitudinal tendinous Interſtice whereby the Fibres of the Antagoniſt Muſcles are conjoin'd.

Thus you ſee a wonderful Contexture of four Muſcles, ſo contriv'd s to perform all kind of Motions; for as either in the *Femur* or *Hume- us*, from Flexion, Extenſion, Adduction, and Abduction, proceeds circular Motion; ſo here when the Elevator and Depreſſor, or Retractor act together on either Side, then there is a lateral Motion: And when the Congener *Elevatores* and *Retractores* act, then there is ither Elevation or Depreſſion; and from theſe two, with lateral Mo- ons on both Sides ſucceſſively perform'd, proceeds a circular Motion. But this is not all; we ſee that any Part of the Trunk, either Root or

Extremity, or both at once, can be bended either upwards or downwards; and this, I conceive, is perform'd after this Manner. Theſe Fibres thus obliquely ſituated, are divided into ſeveral *Faſciculi*, which are ſeparated by ſeveral tendinous Interſections; and at the Beginning of each Interſection there is a conſiderable Branch of a Nerve from the hard Portion inſerted, by which one, two, or more of theſe *Faſciculi* may be ſet in Motion, without any other Part of the *Proboſcis* being concern'd.

Dr *Moulins* calls the *Proboſcis* a prolonged Noſe, both from it's Situation and Uſe in Smelling and Breathing. And I think I may with good Reaſon make an Analogy betwixt it and the Tongue: For beſides that there is a great Affinity betwixt the Smelling and Taſting, ſince what's unpleaſing to the Noſe, cannot but nauſeate the Tongue and Palate; inſomuch, that the Noſe may be called a Taſter to the Taſte: They likewiſe agree in this Animal, by reaſon of the Diverſity of Motions in both, and few Muſcles that perform them: And to make further Analogy with the Tongue and it; as the *Geneoglóſſis*, by lengthening it's Fibres from the fore and inner Part of the lower Jaw, whence it ariſes, to the Root of the Tongue, where it is inſerted, ſtretches it forth: So the *Levatores Proboſcidis*, by lengthening their Fibres from the *Tax-Wax* all along the Top of the Head to the Root of the Trunk, ſtretches it forth alſo: And as the *Retractores Proboſcidis* can very well perform the Motions of pulling it in, *Analogous* to the *Styloglóſſis*; ſo the two Antagoniſts on either Side can pull it to the adverſe Side, that it may perform the Actions of the *Ceratoglóſſis*, while the Congener *Retractores* can pull it to that ſame Side, where they act. When, I ſay, that the Fibres from before and behind deſcend obliquely from the tendinous Inſertions at the Middle to thoſe at the Side, I do not mean that they run ſimply ſo, but that the Fibres of each Muſcle are diſpos'd into different *Strata*, and that theſe *Strata* do interſect each other, like Lozenges, or as we ſee the Fibres in the *Muſculus oblique Aſcendens* interſecting thoſe in the *Muſculus oblique Deſcendens Abdominis*, and ſo on; that is to ſay, whereas one Series of Fibres ſeems to deſcend obliquely, the next underneath that aſcends again, and ſo continues throughout the whole Thickneſs of each Muſcle. As to the circular Fibres ſpoken of by Dr *Moulins*, I do not know I ſaw any, neither do I think them neceſſary for pulling up the Trunk, or diminiſhing it as to it's Length: For the great Diſtance betwixt the Origin of theſe Muſcles, and their Inſertion at the Extremity of the Trunk, the longitudinal Poſition of their Fibres till they come to make a Part of it, and the Space they have to act it, and to ſwell their Belly, and their oblique Inſertion in theſe tendinous Lines, may be look'd upon as ſufficient to perform this Motion; and 'tis obſervable for this End, that the Skin is divided into ſeveral *Plicæ* or *Links*, as we ſee in a Worm, when ſhe draws up and ſhortens herſelf. Thus I conceive the forenam'd *Faſciculi* may at the Beginning extremely begin to be contracted,

tracted, then the *Faſciculi* next to them, and ſo in order, till they come to the Root of the Trunk; by which ſucceſſive Contractions the Bellies of all the Muſcles begin to ſwell, and ſo their Fibres diminiſh as to their Length: And there needs no more for ſtretching forth the *Proboſcis* thus contracted, but for the Fibres to refile to their former Poſition; which it may do with the ſame Swiftneſs, as we ſee a Bow doth by it's Elaſticity when once it is ſhot.

The Cavities of the Proboſcis. These Muſcles ſurround two large Cavities two Inches Diameter from the Right to the Left, and three Inches each from above to below, about the Middle of the *Proboſcis*; for as they proceed from the Skull they are very wide, according to the Capacity of the Hole in the Fore-part of the Skull, whence the *Proboſcis* proceeds; of which hereafter. They are divided by a ſtrong *Cartilaginous Septum*, which runs ſtraight from before to behind, along the Middle of the *Proboſcis*. This is the *Septum* whereinto the Muſcles ſituated in the fore and back Part are inſerted. Theſe Holes are Cartilaginous, all round obduced with ſeveral Nerves, whereof hereafter; and endued with a great many Glands for ſeparating a certain *Mucus*, wherewith the inner Surface is always bedew'd, to keep it moiſt, and preſerve it from the Injuries of the Air it ſucks in at Breathing. Theſe two Cavities are of great Uſe, for they draw up and contain as much Water as ſerves the Animal at once, which afterward it emptieth into the Mouth, as it were from a Tunnel: They ſerve alſo for Breathing, Smelling, and uttering the Voice. The *Proboſcis* is not equally great, but from thirty-eight Inches in Circumference at the Beginning, it becomes gradually ſmaller, till it be twenty Inches at the Middle, and at the Extremity eleven Inches. It has an hollow Cartilage, where theſe Paſſages terminate. Round this is a Cartilaginous Margin, which extends itſelf 1 ½ Inch before, and terminates in a Point; and behind it has, as it were, an Hollowneſs, wherein this Point fixes itſelf, and takes hold of any Thing, as it were a Thumb paſſing in betwixt two Fingers, and keeps it during Pleaſure. This Cartilage is of great Strength, and by it the *Elephant* can take up any Thing of great Weight. Fig. 49.

It's Blood Veſſels. I come next to examine the Veſſels and Nerves of the *Proboſcis*. I do not find this Animal endued with any particular Veſſels for this Part; but theſe here, analogous to thoſe in other Animals, ſeem to be adapted for peculiar Uſes. In ſearching for the Origin of the *Proboſcis*, and how it proceeded from the Head, I ſeparated the *Levatores Proboſcidis*; below which I obſerved four conſiderable Blood-Veſſels, a Vein and an Artery from each Side, lying upon and deſcending in a ſtraight Line above the forementton'd Cartilages, and diſperſing their Branches *hinc inde* throughout the Subſtance of the Muſcles, with two large Nerves accompanying them. I had not Time to trace their Origin, but do offer theſe probable Conjectures about them. The External Carotid Artery, which furniſhes Blood to the Muſcles of the Face and lowe Jaw, has already ſuffer'd ſo many Diviſions and Subdiviſions theſe again were involv'd by common *Membranulæ* into different *Faſciculi*, till at length all were included into one common Tunicle. We endeavour'd by Microſcopes to view the Cavity of the Fibres, but could obſerve none: That which I ſuppoſe made it bigger, was, that when it paſs'd thro' the Bone, the *Faſciculi* were more ſtrictly coherent to one another, whereby they occupied a leſſer Space; but no ſooner had they paſs'd it, than they began to be more looſely conjoined within the common Tunicle, by which the whole Nerve appear'd to be bigger.

An Analogy betwixt the Proboſcis *and the* Noſe *in other Animals,* Eye, *and* Tongue.

Thus ſignally is this Member endued with Inſtruments for the Performance of it's different Functions. 'Tis the principal Seat of two of the Senſes, and partially partakes of the third: For by it the Animal ſmells; by it Feeling is perform'd, as by the Hands with us; and by it the fifth Pair of Nerves affords a partial Idea of the Taſte, to what Food it takes hold of, before it conveys it to the Mouth; and it has a great Analogy to the other two Senſes, *viz.* to the Eye, by it's three Pair of Nerves, namely, one for it's Seeing, analogous to the other for Smelling; one for it's pathetical Motions, analogous to the acute Senſation, afforded to the other by the fifth Pair; and one for the Motion of it's other Muſcle, analogous to the hard Portion of the other; and to the Tongue, as we have already ſhewn at large, by it's different Motions, and by it's partial Taſte.

The Abdomen.

I come now to the *Abdomen.* Without having Time to conſider it's Muſcles, I caus'd it to be open'd longitudinally; whereupon the Inteſtines jetted out in a confus'd Maſs; firſt the Paunches or Tripes, as I may call them, (being not unlike the *Omaſum* and *Abomaſum* of an Ox;) and then the ſmaller Inteſtines. Being earneſt to employ what Time I had in viewing the other Parts, I let theſe alone after they were extracted, till *Monday:* But then, by the Heat of the Weather, they were all ſpoiled; ſo that I could not receive any Satisfaction of them, either as to their Structure, Figure, Dimenſion, or Number. The Figure Dr *Moulins* gives of a Part of the *Colon* and *Rectum*, ſeems to be pretty good; for I took a great deal of them, and ſtretched them out upon the Ground: They were about ½ Foot Diameter; but I had not Time to take notice of their preciſe Length.

The Uterus.
Fig. 86.

I next applied myſelf to the Extraction of the *Uterus* and *Bladder.* I could not get the *Vaſa Præparantia* preſerv'd, and only got out the *Uterus* itſelf, with the *Cornua*, *Ovaria*, and Part of the *Ligamenta Lata*, (*a a*) of all which we ſee the *Figure.* 'Tis not unlike the *Uterus* of ſuch Animals as bring forth ſeveral at one Litter, as they call it; for when I had inſtated it, I perceived ſeveral Protuberances to ariſe, (*e e*) as if they had been ſo many *Cellules*, ſuch as Bitches, Cats, Hares, &c. have, for containing the ſeveral *Fœtus's* with their proper *Placentæ* and *Involucra*; which might have determined me to believe, they bring forth more than one at a Time, had not Authors affirm'd the contrary. For whereas the *Uterus* of ſuch as bring forth one at a

It's Cornua.
Cellules.
Ovaria.
Ova.

time, is proportionably large, and the *Cornua* ſmall; here the Body of the *Uterus* was ſo ſmall (*c.*) that one would think it were nothing but a *Bivium* to the two *Cornua*: For after the Tube had paſs'd the *Corona*, which is pretty ſtrong and cloſe, I obſerv'd the *Cornua* (*f. f.*) to ſwell on every Side by Inflation, leaving a *Sulcus* in the middle (*d.*) and theſe different Protuberances to ariſe with Depreſſions, as ſo many Interſtices betwixt them. This Furrow (*d.*) ſeem'd to me to point out the *Septum*, whereby the *Cornua* were divided from each other; and theſe Interſtices to denote, as it were, ſo many Membranes, whereby theſe Protuberances were bounded and formed into *Cellules*, each communicating with one another. Theſe Protuberances (*e. e.*) were regularly diſpoſed, two or three in Number on each Side of the *Septum*; and though ſome of them be obliterated, yet the *Veſtigia* of others do ſtill remain obvious in the dried *Uterus*. I had a great Inclination to open one of theſe *Cornua* or *Cellules*, to know the Truth of what I ſuſpected; but would not adventure, for fear of ſpoiling the Preparation. Each of the *Ovaria* was as big as a large Apple, with the *Ova* fitly diſtinguiſhed by their proper Membranes; being for the moſt Part about the Bigneſs of a ſmall Pea, and all involv'd within a common, thin, and pellucid Tunicle, thro' which they ſhone; but to defend them, there was provided a looſe thick wrinkled Tunicle (*i.*), which I could remove at pleaſure, it no wiſe adhering to the *Ovaria*; but fluctuated above them, and proceeded from the *Cornua* (*g.*). I open'd one or two of theſe *Ova*, and found them filled with a thin limpid Subſtance, not unlike to *Hydatides*, but that the Humour was more viſcous; which is now evaporated in the dried *Uterus*, and the *Ovaria* quite collaps'd. The Extremities of the *Cornua* which received the *Ova* were very narrow; for when I had inflated the *Uterus*, it retain'd the Air for ſome Time, without paſſing immediately out by the *Cornua*; tho' afterwards when I had ſtrictly tied the *Vagina*, I obſerv'd the Air did inſenſibly ſlide out, and now and then I could ſee ſmall *Bullulæ* ariſe toward the *Ovaria*. I could not ſee any fluctuating *Alæ Veſpertilionum*, nor *Morſus Diaboli*; but do ſuppoſe, that the *Ova* are received into the Extremities of the *Cornua* by an *Hiatus*, below this looſe *Involucrum*, which I ſaid defended the *Ovaria*. I connot determine the preciſe Length of the *Vagina* (*b.*), becauſe I know not how much of it might have been cut off; nor the Situation of the *Uterus*, becauſe the Body lay ſupine, and I was obliged to take the Aſſiſtance of Butchers at the taking it out. The *Vagina* was very ſmall and narrow, not admitting above two or three Fingers. It's inner Surface was whitiſh, and moiſten'd by a certain kind of *Mucus*, and all full of *Plicæ* or Wrinkles.

The Bladder.

The *Bladder* is rounder than that of an Ox, and much larger than Dr *Moulins* would have it, for he ſays, 'tis much about the Size of an Ox Bladder; but I found, when inflated, it contained ſix or ſeven *Engliſh* Gallons: And I doubt not but I might have ſtretched it out larger, had I had ſufficient Inſtruments for inflating, for this I only did with my Mouth and a Tube. 'Tis indeed very ſtrong, and the Veſſels appear very prettily diſpers'd through the Tunicles, which I could have eaſily ſeparated, but did not deſign to loſe it. The Ureters were about ½ of an Inch Diameter, and I could have eaſily diſcover'd their Inſertion, if I had not deſigned to preſerve the Bladder. Both *Uterus* and Bladder were involv'd within a Duplicature of the *Peritonæum*, ſo that I had much ado to get them ſeparated.

Since I have gone ſo far in giving an Account of the Parts for Generation in the Female, I ſhall give Dr *Moulins*'s Account of them in the Male, with my own Thoughts about them.

Dr Moulins'*s Account of the Male* Elephant *he diſſected.* Muſculi duo Retractores Penis, *D.* Moulins. *Pag.* 15.

'In ſearching for the *Teſtes*, he found two Muſcles very like them, which he ſuppos'd to have been them, till he had traced them to the inner and lower Side of the *Iſchion*, where he found them implanted: He traced the Tendons likewiſe, and found, that when they had gone ſingly near upon 4 Inches, they join'd in one, which went directly under the Middle of the *Penis*, and reach'd beyond a Crookedneſs he obſerv'd in it. This was in Length about 8 Inches, and terminated within 6 or 7 Inches of the *Glans*, having expanded itſelf into a Membrane. There was beſide theſe a nervous Body, that began underneath near the aforeſaid Tendons, about 8 Inches from the Root of the *Penis*, and reach'd (diſtinct from the Yard) 9 Inches, before it was inſerted again in it, at a Place 5 ½ Inches from the *Glans*.

Their Uſe.

'He is of Opinion, theſe Muſcles in that nervous Body being ſo conveniently placed for that Purpoſe, that the *Elephant* is a Retromingent and probably Retrocoient Animal. The Crookedneſs and bending downwards he obſerv'd in the *Penis*, ſomewhat ſhort of the End of the Tendon, and the Confeſſion of thoſe that were his Attendants, who told him, that when the *Elephant* would make Water, they obſerv'd him to unſheath the *Penis*, and bend it backwards, and ſo piſs between his Legs outward, confirm'd him in that Opinion; by which, he ſays, Nature ſeems to prevent this unweildly Animal's wallowing in it's own Excrements.'

Remarks upon his Obſervations.

Had our Author had the good Fortune to obſerve the *Erectores Penis*, as well as it's *Retractores*, it might have been of Service: For admitting there be ſuch, (as I have no Reaſon to call his Authority in queſtion) 'tis probable there muſt have been *Erectores* alſo, and that upon the following Accounts. Firſt, becauſe 'tis requiſite the *Penis* of the *Elephant* be freed of this Retraction; that whereas it is brought back at the *Minctus*, it may be brought forward at the *Coitus*. 2*dly*, Becauſe it is requiſite that the *Penis* at the *Coitus*, be brought (if not altogether, yet) obliquely upwards: As we ſee when a Horſe piſſes, he firſt unſheaths the *Penis*, which by it's own Gravity declines, and if aſſiſted by a more than ordinary Supply of Spirits, it tends a little forward;

but in the *Elephant* there is always a Supply of Spirits required at the *Minctus*, both to make the *Penis* penetrate the Sheath; (whoſe inner Orifice, as our Author ſays, was ſhut ſo cloſe, that there was not Room for a Man's little Finger to get in, ſo that he was forced to divide it before he could come at the Yard) and endue it with a certain Rigidity, and to ſwell the *Retractores*, whereby the *Penis* being render'd a little ſtiff, may be drawn back. Suppoſing then there be ſuch *Erectores Penis*, we muſt likewiſe conceive them to be of a greater Force and Bulk than the *Retractores*; for if, according to our Author, the *Penis* at the *Minctus* be brought back far beyond the uſual Poſture of the *Penis* in other Animals, we may believe it alſo to be endued not only with Antagoniſt Muſcles to theſe *Retractores*, whereby to bring the *Penis* to ſuch a Poſture as we ſee in Horſes, but alſo to make it aſcend ſo far as is requiſite for the *Coitus*. Beſides it is to be remark'd, 1*ſt*, That the *Vagina* is not placed behind, a little below the *Anus*, as in a Mare, but below in a direct Line with the reſt of the Belly, whereby there is a Neceſſity for the *Penis* to aſcend. 2*dly*, The *Oſſa innominata* aſcend obliquely, which muſt oblige the *Penis* to do ſo too. 3*dly*, The Author's Account of the *Penis* itſelf, (for he ſays 'tis bigger than that of a Horſe, but not ſo long) ſo that it can hardly be ſuppos'd both to bend backwards, aſcend again, and enter the *Vagina* ſo far as is requiſite.

Their Manner of Procreation.

As to the *Manner* of their *Procreation*, Authors differ very much. Some aſſerting that it is *Retrocoient* and *Retromingent*; amongſt whom is Dr *Moulins*, from the Obſervation he made of the Situation and Structure of the *Penis*, which I have anſwer'd. Others obſerving the Diſtance betwixt the *Anus* and *Vagina*, and that the Dugs are ſituated between the fore Limbs, are of Opinion, that the Female is in a Supine, and the Male in a Prone Poſture: Among whom is *Tavernier*, who tells us, 'That the Female gathers a great many Herbs 'and Weeds, and makes her Bed ſome 4 or 5 Foot high from the 'Ground, where ſhe throws herſelf, and lies on her Back in Expectation of the Male, whom ſhe invites by a peculiar Cry;' therefore perhaps it may be, that the Dugs are placed ſo forward to avoid the Preſſure. A third Opinion is, that at the *Coitus*, the Female deſcends into a Ditch, and that the Congreſs with the Male is no otherwiſe with them, than with other Quadrupeds. As to the firſt, I can ſcarce believe it probable, becauſe there can be no ſuch Thing as a Retrocoient Animal; for that would quite invert the Order of Nature, and give a far different Motion to the Muſcles of the Thighs, than they can be ſuppoſed to have from their Situation; and I am credibly inform'd by thoſe who have been at the Pains to obſerve them, that Hares, Cats, Rabbets, *&c.* which are ſaid to be Retrocoient, do copulate no other Way than Dogs, and other Quadrupeds; and that retrograde Poſture we ſee Dogs in at that Time, is nothing but an Endeavour to get rid, when (by means of the ſwelling of the *Glans*) the Male and Female are too cloſe together, and far from a Deſign of pentrating farther into the *Vagina*. As to the ſecond Opinion, were it not for Mr *Tavernier*'s Aſſertion, I ſhould think it too unwieldy an Animal, and of too ſmall an Inclination to lie down, to acquire ſuch a Poſture. The third Opinion is, that the natural Sagacity of the Animal diſpoſes the Female to go into the Ditch, and both the Fore and Hind Legs ſeem to be ſo articulated as to favour this. For when the Female would bring her Body low, ſhe has no more to do, but to ſtretch forward her Fore-Feet, and then the Articulation of the *Humerus* with the *Cubitus* will bend backward; and to bring back her Hind-Feet, ſo as to bend the Knees forward, by which ſhe can bring the Fore-part of the Body ſo low, as to make the *Nates* protuberant, and bend the Hind-Legs, whereby to put the *Vagina* in a convenient Poſture for the Reception of the *Penis*, according to that of *Ariſtotle*, *ſubſiſtit Fœmina clunibuſque ſubmiſſis, inſiſtit pedibus ac innititur*; and elſewhere, *Flectit certe ſuos Poſteriores Poplites modo Hominis.* Which of the two laſt Opinions may be true, I know not, but we have the Aſſertion of two famous Authors for both.

Dr Moulins's *Account of the* Teſtes.

'The *Teſtes*, he ſays, were not contained in a *Scrotum* or *Capſula*, 'but lay in the *Perinæum*, cloſe joined on each Side to the *Penis*. 'They were neither of the uſual Shape, Bigneſs, nor included in a '*Proceſſus* of the *Peritonæum*. Their Shape was very like that of a 'Cheſnut. They were thicker on the Side that grew to the *Penis*, 'than on the oppoſite. They were flat and round, and not ſuitable 'to the other Parts of his Body, being no more than about 3 or 4 'Ounces in Weight. They were joined to the *Penis* by a great many, at leaſt 100 Seminal Tubes, which may be properly call'd *Vaſa* '*Deferentia*, and which depoſited the elaborated *Semen* in ſeveral '*Rhomboid Cells*, placed in the Body of the *Penis*, which in this 'Creature was the common and only Repoſitory, where the Seed 'could be found. Theſe Cells were turgid with Sperm, and ſo were 'the Tubes: The latter were very large, receiving a Block-Tin Wire 'of an equal Thickneſs with the biggeſt ordinary Pins, or above an 'Inch, when the Tube was ſtraight, as moſt were; but being purſued 'farther into the Body of the *Teſtes*, they became ſmaller and ſmaller, 'till they diſappear'd. The Blood came into the *Teſtes* by the *Vaſa* '*Deferentia*.'

Our Author as he proceeds, is ſomewhat perplex'd; and therefore I chuſe to continue in his own Words, that you may the better know his Thoughts of this Part. He ſays, 'Tho' theſe were ſmall and 'diſproportionable, yet he took them to be the *Teſtes*, nothing elſe 'outwardly appearing that contain'd Seminary Veſſels; until he 'underſtood by Dr *Needham*, that his Deſcription of the *Teſtes* 'of the *Elephant* did agree to the *Proſtatæ* of a Bear: Upon 'which he miſtook the *Teſtes* for the *Proſtatæ*, there being a great 'Reſemblance between theſe Animals; and having found two Sub-

'ſtances betwixt the Kidneys and Neck of the Bladder, which might 'very well be *Teſtes*, and which, 'till he diſcours'd that ingenious 'Gentleman, he did not know what to make of.' And then he proceeds:

Venæ præparantes.

'The *Venæ Præparantes* were large: He divided that which was 'inſerted into the Emulgent lengthwiſe; and within a little more than 'an Inch of it's Inſertion he found many Valves, to the Number of 'about 8 or 10, of divers Shapes, all fitted to hinder the Return of 'the Blood into the variouſly divided Spermatick Vein, which here 'from 8 or 10 Rivulets became one great Channel. Within about an 'Inch of this, and ſomewhat more than two from the Kidneys, he 'found a Subſtance of the Shape of a Pear, but near three times the 'Bigneſs of a very large one. He was at a Loſs to know what this 'might be, and confeſſes he can give but an imperfect Account of it, 'ſince the Butchers cut it out, and ſo it's Continuation with the *Teſtes*, '*Penis*, and other Parts, could not be diſcover'd.

'What he obſerv'd in it was, that the Spermatick Veſſels enter'd 'but a little way into this Subſtance; but below the middle of it he 'found them more deeply placed, and their Branches grew ſo ſmall, 'and leſs numerous to the Sight, as if here the Veins began. The 'inner Part of this Subſtance look'd of a paliſh, but ſomewhat 'muddy red Colour. 'Twas very ſpongy, not much more compact 'than the Lungs of young Animals. He doubts not but this Subſtance 'was deſigned to prepare the *Semen*; but by what Veſſels it 'was brought to the *Penis*, or any other Repoſitory, (itſelf containing 'none) he could not diſcover; neither could he find any peculiar 'Veſſel, or *Ductus*, or any Thing that reſembled that beforemention'd 'Subſtance, by which he might be directed in his Enquiry. It lies 'lengthwiſe from the Kidney to the *Teſtes*, with the biggeſt End 'loweſt. He is of Opinion, from what he has heard from Dr *Needham* of theſe Parts, that theſe two Pear-faſhion'd, now deſcribed 'Subſtances, were *Teſtes*; their Place, Size, Figure, and occaſional 'Cutting the *Vaſa Deferentia*, being the Occaſion of his former Ignorance in this Point.

'He could obſerve no *Veſiculæ Seminales*, nor any common Receptacle for the *Semen*, except the formerly mention'd *Rhomboid Cells* 'in the *Penis* itſelf; but doubted not there might be ſome ſtill, tho' 'his being intent upon other Things made him neglect the Diſcovery 'of them.' Thus he ingenuouſly confeſſes his Miſtake of the *Teſtes* twice, and he leaves them in doubt the third time: However this may ſerve as a Precaution to ſuch as may have Occaſion to diſſect ſuch a Subject as this hereafter.

The Liver.

The *Inteſtines*, *Uterus*, and *Veſica*, being extracted, I laid aſide the two laſt, in order to a future Preparation, and went to extract the Liver, which takes Time in other Animals. Whether by the Haſte made in taking it out, or not, the *Liver* of this Subject had any ſuch *Membrana Hepar inveſtiens*, as Dr *Moulins* ſpeaks of, I ſhall not be too poſitive; but am ready to believe it had none, and that the *Membrana* mentioned by him is nothing but the proper Tunicle of the Liver, raiſed by Fire, as we ſhall ſee hereafter; and my Reaſon for thinking ſo, is, that I was very careful to have it taken out whole. 'Tis true the Inteſtines being taken out in haſte, I had not ſo ſoon an Opportunity of obſerving the *Ductus Communis*; but I viewed the reſt of the Liver exactly, and cauſed the Figure and Dimenſions of it upon the Place to be took (being 36 Inches long, and 22 at the broadeſt Part) becauſe it would not keep. I was indeed in great doubt, what to think of the *Veſicula Fellis*, when I did not find it. Both the *Vena Cava* and *Porta* were very large, and had their *Exit* and Entrance in the concave Part of the Liver, as you ſee. This had only one Lobe, but both the Veins diſpers'd themſelves, firſt into two large Branches, and then were ſubdivided there, as in the ordinary Manner. I open'd ſeveral, and found them differ in nothing from other Animals; the Subſtance being firm, as is uſual, and *Glands* large and conſpicuous; the external Surface ſmooth, and it's proper Tunicle firmly adhering to the *Glands*; which is all I obſerv'd in it. See the *Figure*. Fig. 116.

But becauſe Dr *Moulins* does tell us of a *Membrana Hepar inveſtiens*, I ſhall give you his Account of it; as alſo of the *Bile* and *Porus Biliarius*, which I can give no Account of myſelf. He ſays, 'The 'Membrane that inveſted the Liver, was raiſed from it a conſiderable Way, as if it had been joined to it. Though this Membrane 'ſeemed to be whole, and look'd like the *Cuticula* raiſed by a 'Bliſtering Plaiſter, yet there was no *Serum* contained in it; and where 'it ſeemed to be intimately join'd to the Liver, by a gentle Pull it 'came off, without tearing any Thing that I could take notice of, 'as if it had been but very ſlightly faſten'd to the Liver; or rather as a Bag, which contained and exactly fitted it. He takes the 'Uſe of this to be chiefly to terminate the Capillary Veſſels, and prevent the gleeting of ſerous Humours; and concludes, that he muſt 'wholly impute the clear in ſome Places, and in others that eaſy Separation of the Membrane from the Liver, to the Fire:' By all which it ſeems to be nothing different from the proper Membrane which I obſerv'd, and you ſee the Circumſtance of firmly adhering and looſely inveſting.

His Account of the Bile.

The *Bile*, as he gives an Account, was depoſited at the End of the firſt Gut, 4 ½ Inches below the *Pylorus*; from whence he traced the *Ductus Communis* to the Liver, to ſee the *Veſicula Fellea*; but it was wanting, and in the Place of it he found the *Porus Biliarius* coming out of the Liver, as the *Ductus Hepaticus* uſually does. He obſerv'd likewiſe, that the *Bilis* found in that, differ'd both in Colour and Conſiſtence from that he found in the *Ductus Hepaticus*; for the latter was of a clear light yellow Colour, congeal'd like a Jelly, and the former of a dark Green, and ſomewhat more fluid than the Gall of an Ox.

I fail'd alſo to obſerve the *Pancreas*, becauſe it was taken away with the reſt of the Inteſtines; and therefore ſhall give Dr *Moulins*'s Account of that too.

Of the Pancreas.

‘ The *Pancreas* was very long and large; for it reach'd from about
‘ the Middle of the Stomach to the *Jejunum*, which Space could not
‘ be leſs than 6 Foot. 'Twas a *Glandula Conglomerata*, as the *Pan-*
‘ *creas* always is, and had it's *Ductus* ſo wide, that it could with-
‘ out Force contain one's little Finger. It open'd into the Gut, where
‘ the *Ductus felleus* did. whether both the Paſſages join'd into one
‘ before their Aperture into the Inteſtines or not, he has forgot. The
‘ *Succus* in the *Ductus* was not limpid, as it uſually appears, but of
‘ a very dark green Colour, and yet very fluid; ſeeming to contain no
‘ viſcous Phlegm.’

Of the Spleen.

The *Spleen*, of which I had not Time to take the Figure, was in this Subject $3\frac{1}{2}$ Foot long: On the Backſide it's Edge was ſomewhat curv'd, almoſt in Shape of an unbended Bow: On the Foreſide, from a narrow Point at each End, it enlarg'd itſelf by Degrees, till it came toward the Middle, where the Veſſels enter'd, where it was broadeſt. Whether the *Vena Splenica* went forth by one, two, or more Orifices, I cannot poſitively determine, it being cut off in haſte; and when cut off, I ſaw it ragged for the Space of 4 or 5 Inches; which I conceive to be becauſe of the Orifices of ſo many Veins. It was thin and flaccid; what Blood was preſs'd out of it, was blacker than any I had ſeen throughout the reſt of the Body. If it had not been unwarily cut by ſeveral Slaſhes of the Butcher's Knives, I deſign'd to have blown it up and prepar'd it. I cut off a little of it, and preſſed out of it venal grumous Blood from ſeveral of it's *Cellules*. It was in Breadth from 3 Inches toward the Extremities, to 8 Inches about the Middle.

Glandulæ Renales.

The *Glandulæ Renales* were placed after the uſual Manner: They were about 5 Inches long, 2 Inches broad, and oval, with a looſe outer Coat, which I remov'd, as it had been a Sheath; within which was contain'd the *Gland* itſelf, being divided into ſeveral Lobes, like the Kidney of an Ox; from whoſe Interſtices there paſſed ſeveral thin *Membranes*, which paſſing to the looſe *Vagina*, kept it faſt, and by which this *Vagina* was only coherent with it. It's Veſſels were cut off ſo ſhort, that I could make nothing of them. I cut it longitudinally, and found in it a Cavity, which could contain about two Ounces, all l of a black grumous Blood, in Colour much like that I obſerv'd the *Spleen*. I ſhall not much inſiſt upon the Uſe of theſe two *Viſ-ra*, about which there is ſo much Debate; but only ſay in ſhort, that t is probable, as the Spleen is to the Liver, ſo are theſe *Glandulæ Re-alæ* to the Kidneys, that is to ſay, whereas the Blood after it is diſtri-uted into the Inteſtines by the ſeveral Arteries which proceed from e *Aorta*, is receiv'd by the Orifices of ſo many Veins, as ſerve to make up ſo many *Radices Venæ Portæ*; it is convenient this Blood ſhould be animated by a new Supply of Spirits, the better to enable it to continue it's Circulation in the *Porta* through the Liver, and diſpoſe it for the better Separation of the Bile; for which Uſe the Spleen ſeems to be adapted, both from it's Situation in reſpect of the Liver, the Venal Blood of the one entering the *Porta* for the other: it's Structure; *Mora* of the Venal Blood, after diſcharg'd from the Arteries: and a conſiderable Branch of a Nerve furniſh'd to it: So the Kidney being a *Viſcus* where there is a vaſt Separation of *Serum* requir'd, theſe *Renes Succenturiati* ſeem to be deſign'd for furniſhing a new Supply of Spirits to the Venal Blood, after it has paſſed the Kidneys, and undergone this Secretion: Both which Uſes, I doubt not, may appear from their Structure.

The Kidneys. The Kidneys were of a large and proportionable Size, being one Foot in Length, and ½ Foot in Breadth, of the uſual Figure, much like that of a Man; their external Surface ſmooth, and equal with their external Coat, cloſely adherent to the inner Subſtance, without any perſpicuous Lobes to be ſeen externally; but when I open'd one of them, I perceived 6 large *Carunculi Urinarii.* It's Subſtance was very obvious, and correſpondent to the Structure uſually obſerv'd in the Kidneys; *a. e.* the glandulous Subſtance externally was very conſpicuous, for the Space of about ½ Inch in Circumference; then began to appear the *Tubuli Urinarii,* firſt ſmaller and leſs obvious; then another Series larger, and a third ſtill larger, till they began to ſurround each of the *Carunculi,* like ſo many Rays of the Sun. I had no Aſſiſtance of Microſcopes, (for I open'd it in the Field on *Monday*) and therefore did not ſee ſo clearly the *Coalition* of the ſmaller *Tubuli* into the larger Ducts: But as it happens in all theſe Excretory Veſſels, they did not appear branched and divaricated, as Blood Veſſels uſually are; but continued parallel to each other, till from the leſſer to the greater, they at laſt emptied themſelves into the common Receptacles. I am not poſitive whether there was one common Ureter, into which all the ſix *Caranculi* did empty themſelves, or if each had a particular Branch of an Ureter, into which they were diſcharged; only I remember I ſaw no *Pelvis,* which for the moſt part happens where the *Caranculi* are very large. The Reaſon of my Uncertainty about the Ureters, is, that after I caus'd the *Thorax* and *Abdomen* to be open'd on the *Saturday,* I let alone the Kidneys till the *Monday*; but they being involv'd within a Duplicature of the *Peritonæum,* and no Fat ſurrounding them, that Membrane was ſo dried up and ſtiff, that even the Butchers Knives were ſcarce able to pierce it: So that requiring the help of a Butcher, who aſſiſted at excarnating of the Bones, he took out the Kidneys without any regard to the Veſſels; for the *Renes Succenturiati* were taken out the Day before, when all the Parts were ſoft and flexible. And here in general I muſt tell you, that the Fleſh of this Animal was for the moſt part ſo ſtrong, that no Launcet I had, how keen or ſtrong ſoever, could do any Service; So that I was forced to make uſe of Butchers Knives, when I could not admit of their Hands.

I come next to the *Thorax*, where there was ſcarce any thing remarkable. One of the Lobes of the Lungs was open'd by the Butchers, and the other had nothing obſervable, but it's Bigneſs, which was proportionable enough. It did not adhere to the Ribs, as in Dr *Moulins*'s Subject; but lay flaccid on the one Side of the Heart, as the other had done, before it was mangled, on the other Side; ſo that I look upon this Adheſion of Dr *Moulins* to have been in a morbid State. At firſt I deſigned to have taken out the whole *Viſcera Thoracis*, till the Butcher prevented me; and as I began to direct him between the two firſt Ribs, I ſaw two large Glands, one ſituated on the Outſide of each of the *Carotides*, as they paſſed out of the *Thorax*; they were round, and near the Bigneſs of a Turkey Hen's Egg, each having a conſpicuous Artery inſerted, and a Vein paſſing from them. Theſe I took to be the *Thymus*; which, tho' ſeldom obſerv'd in adult Subjects, yet, perhaps, may at all Times be ſeen in ſuch a large Animal as this. I cut off one of them with Part of the adherent Artery; and could obſerve nothing at the opening of it, but ſeveral looſe thin Membranes without, which I ſuppoſe to have ſupported and contained in the Cavity (whoſe Sides they deſcribe as they run to and fro) a great deal of Fat, when the Animal was in good Caſe; and a firm glandulous Subſtance within, without any Cavity. I ſhall not poſitively determine, whether theſe were actually the *Thymus*, or only adventitious Glands; but becauſe they were regularly ſituated, which ſeldom happens to adventitious Glands, 'tis probable they were. Their Veſſels were proportionable to their Bigneſs, but I can ſay nothing to their Uſe. When I ſaw I could not extract the *Viſcera Thoracis* whole, I traced one of the Branches of the *Aorta Aſcendens* down to the Heart; and was ſurpriz'd, when I cut it above, to ſee a fat-like Subſtance jet out of it; and pulling it, I got upwards of two Foot in Length, of a *Polypus* adapted to the Capacity of the Artery, which was about 2 ¼ of an Inch Diameter. This *Polypus* was no wiſe fibrous, but, as it were, ſo much Fat moulded after ſuch a manner, being not unlike the Blade of a broad Sword, near to ¼ of an Inch at the Middle, and much thinner at the Edges, tough and flexible, with ſome grumous Blood, not ſo firmly compacted, at the Extremity.

Thymus.

A Polypus *in the* Aorta.

When I came to the *Heart*, I ſaw all it's Veſſels very large; the *Bivium Aortæ* very conſiderably thick and ſtrong. There was nothing about the Heart remarkable, except the Bigneſs, which was proportionable to the Body. The *Auricles* were large, and at the Left as well as the Right full of grumous Blood. At the opening of the *Ventricles*, I found them both fill'd with the ſame *Polypus*; which ſtrangely twiſted itſelf in among the Valves, both *Tricuſpides* and *Semilunares*, and alſo among the fleſhy Columns, at the Bottom of each *Ventricle*; which

Heart.

Polypus Cordis.

here ſeem'd to be ſo many little ſtrong round Muſcles, ſome ¼, others ½ and others near one Inch long, with a round fleſhy Belly, and two Tendons variouſly ſituated, as you ſee in the Hearts of other Animals. Theſe *Polypus*'s, from a maſſy Subſtance in the Middle of the Ventricle, ſent forth to all Parts their Branches, which here and there twiſted themſelves round theſe fleſhy Columns, their tendinous Inſertions, and the tendinous Fibres of the Valves, with a wonderful Intricacy. In a Word, there was no Angle, no Corner nor Cavity, which the *Polypus* did not occupy: And yet ſo much was it diſengaged from the Subſtance of the Heart, and 'twas ſo ſtrong and tough, that by puling it's groſſer Part in the Middle, all the other Branches mov'd; and by cutting a few Parts of it, where it was moſt engag'd, and where the fleſhy Columns were thickeſt, I got it out all together; and having ſtretch'd it out, did pleaſantly behold theſe Ramifications, proceeding from it's groſſer Part, like ſo many Thongs or Laces, whereinto a Piece of Leather had been cut, ſome broad and ſome narrower; but none very thick; of a yellow Colour, and fat Subſtance; each of them weighing one Pound, which I may ſafely ſay, was more Fat than was upon all the Body beſide.

The Mouth. Having but little time to take notice of the external Parts of the Head, either in reſpect of the Muſcles which move it, the *Larynx*, *Pharynx*, or Tongue, or in reſpect of the Salivatory Veſſels, which empty themſelves in the Mouth; I only obſerve, that the Mouth is very little and narrow, in Proportion to the Body, and that upon theſe Accounts: 1. Becauſe neither Lips nor Teeth are employ'd in gathering the Food, as in other Quadrupeds; ſo that the Mouth only ſerves to receive the Aliments from the *Proboſcis*, which both gathers and conveys them into it. 2. The *Dentes Maxillares* are of ſuch a Thickneſs, both in the upper and lower Jaw, but eſpecially the latter, that they ſerve to render the Mouth narrow; nor need it be broader, becauſe the Strength of the Grinders is ſuch, that they can at once render the Aliments ſo ſmall, that there is no need for the Tongue to move them to and fro' in the Mouth, in order to have them further maſticated, as in other Animals; therefore is the Tongue ſmall, ſhort, and round, terminating in a Point, thick, and not thin and flat as in Oxen, with a ſoft ſmooth Surface, without any perſpicuous *Papillæ*; by which it ſeems not to chew the Cud.

The ſhort View I took of the Tongue, hinder'd me from obſerving that ſingular Structure mention'd by Dr *Moulins*. All I took notice of peculiar to it, was the firm Adheſion of the *Thyroïdes* to the *Os Hyoides*, which made me ſeparate and preſerve both; whereof ſee the *Figure*. Fig. 117,118. As to what Dr *Moulins* ſays, it ſeems to me very improbable; and I am ſorry the Head ſhould have been ſo mangled at the cutting off, that I was neither able to receive, nor give any Satisfaction about it. However, I ſhall give his Account, and mention my Doubts.

'The Paſſage, ſays he, to the Ventricle, was through a peculiar Hole, near the Root of the Tongue, and exactly in the Middle of that Part; which Hole was the Beginning of the *Œſophagus*: There was no Communication between this and the Paſſage into the Lungs, contrary to what happens in other Animals; for the *Membrana Pituitaria anterior* reach'd to the very Root of the Tongue, below the *Œſophagus*; ſo that it could emit no Voice by the Mouth, but by the Trunk. This *Membrana* had many Paſſages for the *Saliva*, uſually ſeparated there. There was between the End of the *Proboſcis* and the *Larynx*, a *Membrana Pituitaria poſterior*, which had many of the ſame Sort of *Ductus*.'

An Obſervation of Dr Moulins's, *concerning the Paſſage from the* Larynx *to the* Proboſcis.

This, I confeſs, ſeems to depend upon particular Obſervation, and yet I canot ſee how it can well happen; for every one is ſenſible, that the *Larynx* occupies the Fore-part, and the *Œſophagus* lies behind, between the *Vertebræ* and *Larynx*. Now how the *Œſophagus* can lie thus behind, and yet have ſuch a Communication with the Mouth, as to hinder the *Larynx* from communicating with it, is to me a very great Doubt.

Remarks *upon the foreſaid Obſervation.*

He proceeds, 'the *Aſpera Arteria* was very large, and deſtitute of an *Epiglottis*, there being no Danger of any thing falling into the Lungs from Eating and Drinking, ſeeing there was no Communication between the *Œſophagus* and it.' Here the difficulty ſtill remains; for how can Aliments be ingeſted into the Mouth, and not paſs over by the *Larynx*, as is ſaid, before they enter the *Œſophagus*; that would imply, that the *Œſophagus* lies before, and the *Larynx* behind, which would quite invert all the Rules of the *Oeconomy* of Animals: Since then the *Œſophagus* muſt have in it's Deſcent paſs'd in betwixt the Head and Lungs, and then penetrated the *Diaphragm* or otherwiſe, and after it had deſcended a little, muſt have turn'd aſide and paſs'd behind the *Larynx*, as the *Arteriæ Iliacæ* do over the *Venæ Iliacæ*, which, tho' by cutting off the Head, I could not obſerve, yet is what ſeems improbable to me; becauſe then at the Deglutition, by the Preſſure of the *Œſophagus* on the one Side, and the *Vertebræ* of the Neck on the other, ever and anon would the Animal be oppreſs'd with a Difficulty of Breathing when it took Food.

He ſays further: 'To the Outſide of theſe Cartilages heound another grow, which was faſten'd to them, but ſo as to be capable of moving up and down, by the Help of ſome Muſcles which were implanted in it. 'Twas ſtrong on both Sides of the *Aſpera Arteria*; but oppoſite to the *Œſophagus*, or on the underſide it was very limber. This wanted about 2½ Inches of coming round the aforeſaid Cartilages, (*viz.* the *Cartilagines Aritænoides*, which made a *Glottis*, in Length, about 3¼ Inches, and in Breadth about 1½ Inch about the Middle, whoſe Aperture was ſomewhat oval) on the upper Side, or that next to the *Œſophagus*. This ſeem'd to ſupply in ſome meaſure the want of an *Epiglottis*, in leſſening the *Glottis* to prevent the creeping of Animals into it.'

The Head. Being come to the *Head*, I have very little remarkable to add in this Place: For the Brain itſelf very little differeth from that of an human one, except in Bigneſs, and ſomewhat in Figure; the other being ſomewhat oval, and this more round. The *Dura Mater* was a ſtrong thick Membrane, every where diſengag'd from the *Pia Mater*; which, together with all the Subſtance of the Brain, was much more tender, ſoft, and flaccid, than could have been expected. Whether this proceeded from keeping the Head two or three Days after the Animal died, before it was diſſected, the Weather being then very hot, or from the languid Diſtemper whereof it died, I know not. It's Subſtance, Ventricles, and other Parts, were the ſame as in other Animals. The *Cerebrum* had three large Productions at the *Baſis*, one anterior, from whence the *Nervi Olfactorii* proceed, and two lateral on each Side of the *Cella Turcica*, reaching from the *Proceſſus Petroſus* behind, to the above-named Production before: For the Blood-Veſſels and Nerves, which enter in and proceed from the Brain, we ſhall diſcourſe of them more particularly, when we come to the Holes of the Skull. I muſt not forget, that at the opening of the longitudinal *Sinus*, there were alſo *Polypus*'s which proceeded from the Orifices whereby the Blood emptieth itſelf in the *Sinus*.

Thus far the Anatomical Account of the ſofter Parts of this Animal; which I acknowledge to be deficient in many Things, and thoſe conſiderable. I rather choſe to give a lame Account of what conſiſted with my own Knowledge, than to give meer Conjectures for poſitive Truths in order to render it more compleat.

The Oſteological *Account of the* Elephant. I come now to the next Thing I propos'd, the Structure and the Parts of the *Bones* of an *Elephant*.

I ſhall begin at the *Head*; where I ſhall firſt take notice of it's external Shape in general; next give an Account of the Bones whereof 'tis compos'd: and laſtly, give a particular Deſcription, firſt of it's external, then of it's internal Parts; ſhewing their particular Dimenſions and Weight, and aſcribing their Uſes to each of them as they occur, and as we can probably conjecture.

The Skull. The Head (A) being compos'd of the Bones of the upper and lower Jaw, on it's upper Part is almoſt round, having two Eminences with a Depreſſion in the Middle before; which Depreſſion, as it runs back, becomes a deep *Sinus*; and theſe Eminences drawing nearer to one another, as they aſcend behind, inclining obliquely forward, are not unfitly compared by Mr *Ray* to a Man's Buttocks: About it's middle Part it is almoſt Quadrangular, being flat before, 'till it comes to the Root of the Trunk (*a*), where it is depreſs'd, for the more convenient Lodging of the *Proboſcis*, 'till it has paſs'd over the Mouth (*b*). At each Side 'tis much contracted for the moving of the Muſcles of the lower Jaw (*c*), at it's back Part it becomes very narrow, with ſeveral Eminences, *Sinus's*, and Holes; of all which in order. At it's lower and fore Part, the Bone of the Palate is narrow, where the *Pro*- Fig. 61.

boſcis hangs over: On each Side of which are the *Alveoli* for the Tuſks: and behind, the Lower makes up all the reſt of the Head, as to it's external View.

Of the Fore-part *of the* Skull. Fig. 62.

We ſhall begin the particular Deſcription of the external Parts of the Head at it's Fore-part; the Diameter of whoſe Upper-part is three Foot, the two Eminences are almoſt round (*d. d.*), and the *Sinus* in the Middle is 10 Inches from the Right to the Left, and two Inches deep (*e.*), from thence deſcending five Inches, the Bone is flat before, and begins to form an Angle on each Side for the Cavity, which contains the Muſcles of the lower Jaw and *Proboſcis*, between which Angles 'tis 11 Inches (*f. f.*), thence deſcending gradually, the Angles tend outward, till they come to the upper Production for the Orbit of the Eye (*g. g.*), where they are 17 Inches; betwixt which is ſituated the Hole for the Root of the Trunk (*a*). This Hole runs acroſs the Head, being from the Right to the Left 12 Inches, and from below to above on each Side 7 Inches; for in the Middle it has a Protuberance where the *Cartilaginous Septum* aroſe, which deſcends two Inches, and terminates in an obtuſe Point. Within this Hole are to be ſeen ſeveral of the *Laminæ*, whereof the *Cellules* which run betwixt the two Tables of the Skull are compos'd (*h. h.*), of which hereafter, with the *Vomer* in the Middle (*i.*) whence the *Septum* of the Trunk ariſes. 'Tis pretty thick here, and is compos'd of two *Laminæ*, with a ſpongy Bone in the Middle. At it's Upper and Fore-part it communicates with the *Os Criboſum*; and you may ſee the ſeveral Perforations, through which a great many Branches of the *Nervus Olfactorius* paſs, and cover the Surface of the *Cartilaginous Septum*. At it's Lower and Back-part, where it becomes gradually thinner, it divides the *Choana* into two; whereof hereafter. At the Lower-part of this Hole the Bone becomes concave (*k*:), ſo that meaſuring from the Middle of the Orbit of the Eye on both Sides, which are 3 ½ Inches diſtant, the Depreſſion becomes two Inches deep. At the Middle of the Lower-part of this Hole begins a Suture, which runs down to the Extremity of the Bone (*m. m.*). Theſe two Bones are articulated *per Symphyſin*. Dr *Moulins* calls theſe *Oſſa Maxillæ Superioris*; but I rather incline to call them *Oſſa Palati*. They are 5 Inches broad at the Upper-Part, where they are articulated with the *Oſſa Maxillæ Superioris*, by Dr *Moulins Oſſa Malæ*, by the ſame kind of Structure (*n. n.*). From the Upper-part to the lower Extremity of this *Os Palati* (*b.*) it is 15 Inches. After they have quitted the *Os Maxillæ Superioris* on each Side, they run down with an obtuſe Angle; being protuberant on their outer Side, they incline gradually toward the Suture in the Middle (*m. m.*) forming a Cavity 2 ½ Inches deep at the lower Extremity, which is not ſo deep as at the Middle. 'Tis deſign'd for the *Proboſcis* to reſt upon, and the Eminences of each Side are for granting Space for the *Alveoli*; whence the Tuſks proceed (*o. o.*) which are improperly call'd Teeth, (and therefore this Bone which contains them ſhould not be call'd *Os Maxillæ*) ſince they only ſerve for a Defence to this Animal, and ſhould rather be call'd it's Horns. They are of different Bigneſs in different Animals, and the Male ſeems to have them bigger than the Female; *v. g.* The *Elephant* which was burnt at *Dublin*, had them much bigger than this which died here; which conſiſts with the Knowledge of ſeveral in this Place, who remember to have ſeen both: And the Figure which Dr *Moulins* gives of them, even tho' broke, ſeems to repreſent them much larger than thoſe in the Subject we have; which are very ſmall, not exceeding the Bigneſs of an ordinary Cane, or not above one Inch Diameter, and ſtraight, ſo far as they remain unbroke: So that I am not in a Capacity to affirm or deny the Aſſertion of *Ariſtotle*, who ſays, *Mares grandiores reſimatoſque habent, Fœminæ minores, & contra quàm Mares, vergunt enim deorſum, pronique deviant.* Perhaps it might have been ſo with theſe; and that the Keepers (that the Difference of the Sex might not be known, by their bending downward or upward) might have deſignedly broke them. Indeed there is great Difference between the Weight and Length of theſe, had they been entire, and thoſe wonderful big ones, whereof Authors give us an Account. *Tentzelius* tells us, That the Length of thoſe deſcrib'd by him is 8 Foot; and he, with ſeveral others, tells us, that there are of them which weigh 100 Pound and upwards, ſome 140, others 150, and thoſe he talks of were above 100 Pound; inſomuch that *Tavernier* tells us, That in the *Indies* they make Poſts of Doors and huge Pales of them: And 'tis memorable, which he ſays alſo, that the *Elephants* of the Iſle of *Ceylon* have no Tuſks, but the firſt which the Female produces: And this we have confirm'd by Mr *Knox*, in his Relation of this Iſland, that few of the *Elephants* there have Tuſks, and thoſe only Males.

Of the Tuſks.

There is a great Debate among Authors, whether theſe ſhall be call'd Horns or Teeth. Thoſe who would have them to be Horns, ſay, 1ſt. Becauſe they riſe from the Skull. 2. Becauſe they can be poliſh'd, and brought into Form, which 'tis difficult to do with Teeth. 3. Becauſe they fall off and grow up again, which the Teeth of no Animal do, except of Man. Such as would have them to be Teeth, tell us, that 'tis peculiar to ſuch Animals as have the Hoof divided into two, to have Horns; and that Horns are always cavous or ſpongy within; whereas theſe are altogether ſolid. For the firſt Reaſon, that they riſe from the Skull, tho' it be granted, yet it is after a different Manner from Horns; for they always either adhere to the Skull by a certain Articulation, if not cavous, as in Harts, or have a Protuberance ariſing from it, and filling up their Capacity, if cavous, commonly call'd the Flint. For the ſecond, tho' it be granted they can be poliſh'd, &c. yet they are not capable of ſuch Alterations, as Horns are by boiling, or burning in the Fire, ſuch as being made flexible. Indeed, they ſeem more to agree by their Structure with Teeth; for they proceed from the Skull, and are planted in it *per Gomphoſin*; having in theſe we are ſpeaking of a large Cavity, about two Inches long, large according to the

Diameter of the Tuſks, at firſt, but as they deſcend tapering gradually, till they terminate in a Point analogous to the Cavities in the Roots of the Teeth, and filled up with the ſame Kind of Subſtance, whereby they are kept firm in their Places. And as to their Structure, I doubt not but they have been compos'd of a mucilaginous Subſtance at firſt, as Teeth are ; and that afterwards they augment by the Appoſition of ſeveral *Laminæ*, or *Strata*, according as the Animal increaſes in Years. Hence 'tis, that I ſuppoſe *Tentzelius*'s Friend came to be convinc'd, that thoſe Bones he treats of, were of an *Elephant* 200 Years old, by ſuch Marks as theſe *Laminæ*, which might have been taken from the Teeth. Theſe *Laminæ* are very obvious in the Subject we have, and the Smallneſs of the Tuſks ſeems to be another Argument of her being young, according to their Term of Life. Whether they be call'd Teeth or Horns it matters not much ; for if from their Subſtance we take their Deſignation, they may be call'd Teeth ; and if from their Uſe in puſhing, we may call them Horns ; and to avoid any Debate, let them be call'd Tuſks or Defences. They run in this Subject about 6 Inches high in the *Os Palati*, and adhere by a ſtrong Ligament, as is already ſaid.

The Side *of the* Head.

Fig. 63.

Sinus for the Eye.

We proceed to conſider the Side of the Head. We ſaid, that deſcending 5 Inches from the Middle of the Depreſſion in the Fore-part of the Head, which is 7 Inches from the Top of any of theſe Eminences, it becomes to form an Angle (*a.*), and the Side of the Head becomes conſiderably depreſs'd, where the Muſcle of the lower Jaw and *Proboſcis* is lodg'd. This Depreſſion from it's Beginning (*a.*) to the *Os Zygomaticum* (*b.*), (where it is 8 ½ Inches deep) is 14 ½ Inches diſtant ; and from the Fore-part (*g. Fig.* 62.) to the *Orificium Meatus Auditorii* (*k. Fig.* 63.) is 13 Inches ; alſo from the Upper Protuberance of the Orbit of the Eye (*f.*) to the Articulation of the *Os Zygomaticum* with the *Os Temporale* (*i.*) is 9 ½ Inches. At the Fore-part of this Depreſſion is ſituated the *Sinus* for lodging the Eye ; for 'tis improperly call'd Orbit, ſince only the Half of the Part where the Eye is lodged is bony : It has three remarkable Protuberances ; one at the upper and Fore-part (*f.*), whence a ſtrong Cartilage ariſes, and is inſerted in another 7 Inches diſtant (meaſuring obliquely) form'd by the Articulation of the *Os Zygomaticum* with the *Os Maxillæ* (*g.*) and a third in the Middle (*e.*), at 3 ½ Inches diſtant from each of the former. This Protuberance ſerves for the Inſertion of the *Trochlea* of the *Muſculus obliquus major*. The Bottom of the Orbit has another *Sinus* (*s.*), which conveys the *Nervus Opticus* to the Bottom of the Eye, the upper Part whereof is compos'd of a *Lamina* of the *Os Frontis*, which lies over the *Os Maxillæ* : From beneath this *Lamina* not only proceeds the *Nervus Opticus*, *Motorius* and *Patheticus*, but alſo a conſiderable Branch of an Artery, Vein, and fifth Pair of Nerves, which running forward, paſs through a large Hole in the *Os Maxillæ* (*m.*), and are diſpers'd in the *Proboſcis* ; whereof hereafter. This *Sinus* (*s.*), whoſe lower Side is form'd by a *Spine* running along the *Os Maxillæ*, is 9 Inches long, 1 $\frac{1}{2}$ Inch broad at the Middle, and one Inch deep; but as it comes forward, 'tis enlarg'd as the Globe of the Eye increaſes.

The Os Maxillæ Superioris. Fig. 62. The *Os Maxillæ* is a very irregular Bone. At the Fore-part of the Skull it begins with a ſharp Point (*p. p.*), having that Part of the *Os Frontis* which forms Part of the Orbit (*d. Fig.* 63.) on the one Side, and that Part of the *Os Palati* (*m.*) which forms the Hole for the Root of the Trunk on the other; whence running 6 Inches, and inclining inward by a crooked Suture, it terminates in a Protuberance; beneath which is a ſmall *Sinus* aſcending obliquely to the Hole for the Root of the Trunk (*n.*) fram'd by the Blood-Veſſels as they go to the Nouriſhment of the Trunk; from thence it runs obliquely backward, and is articulated with the *Os Palati* by a broad ſquamous Suture. From the middle Protuberance of the *Sinus* for the Eye (*d.*) it runs ſtraight backward, being articulated with that Part of the *Os Frontis* which forms the aforeſaid lower Edge of the *Sinus* for the *Nervus Opticus* (*s.*) for the Space of 18 Inches, where it begins to be overlaid with a *Lamina* of the Bone, which forms the Upper and back-part; whence it deſcends 9 Inches, till it comes to the Root of the Teeth (*n.*) where we ſhall leave it, and return to the fore-nam'd Protuberance; from whence having made up a Part of the *Sinus* for the Globe of the Eye, as is ſaid, it runs backward 6 Inches, and is articulated (by a flat Suture (*g.*) which firſt deſcends $\frac{1}{2}$ Inch, then runs obliquely backward 2 $\frac{1}{2}$ Inches) with the *Os Zygomaticum*. At it's Beginning 'tis 2 $\frac{1}{2}$ Inches broad; plain on it's inner, and convex on it's outer Surface; bended, as it deſcends, like a Horn, and terminating in a Point. From the lower Part of this Suture it becomes much thicker; and having fram'd a *Sinus* about 4 Inches long, it runs toward the Fore-part of the Skull. From this *Sinus*, as it has returned 3 Inches, is form'd the Side of an Oval Hole, which running from before to behind, is about 3 $\frac{1}{2}$ Inches long, and from the one Side to the other two Inches. At the Side which is fram'd by the *Os Maxillæ*, and toward the *Proceſſus Zygomaticus*, 'twas two Inches thick; and at it's other Side, it runs ſtraight backward from the *Os Maxillæ*, in a direct Line, with the great Cavity, which contains the Muſcles that move the lower Jaw and *Proboſcis*. This Hole is analogous to that in a Human Skeleton in the *Os Maxillæ*, beneath the Orbit of the Eye; and is larger in Quadrupeds, being deſtinated for Tranſmiſſion of a Vein, Artery, and the ſuperior Branch of the ſecond Diviſion of the 5th Pair of Nerves, which in thoſe go to the upper Lip and Jaw; but in this Subject, as I have ſhewn, 'tis probable they ſerve for the Nouriſhment and other Functions of the *Proboſcis*. Tho' it be very obſervable, and of ſignal Uſe, yet 'tis ſo ſituated, that I was not capable to give ſuch a View, as might afford a true Idea of it, in any of the Figures of the Head: However, I mark'd it (*r. r. Fig.* 62.) and (*m. m. Fig.* 63.) (8. 8. *Fig.* 64.) From this Hole the *Os Maxillæ* inclines 6 Inches toward the Root of the Teeth (*n*), where we leave it, and return to

The Os Zygomaticum. Fig. 62, 63.

The *Os Zygomaticum* (*s.*) (*b.*) (*i.*), which, as in all other Animals, ſerves for a Guard to the Muſcles which move the lower Jaw. In Men, and ſeveral other Animals, 'tis formed of a Production of the *Os Temporale*, articulated with another from the *Os Malæ* by a particular Suture, called *Sutura tranſverſa*: but here 'tis the moſt diſtinguiſhed Bone of all the Head; for being twelve Inches long, and two Inches broad, 'tis articulated with the *Os Maxillæ* before, and running backward 6 Inches, it meets at it's upper Part with a Production of the *Os Calvariæ* (*f.*) as we may call it, which accompanies it's lower Part other 6 Inches, and then terminates in an obtuſe Angle. 'Tis looſely joined with this Production; and 'tis probable that 'tis capable of conſiderable Motion, upon the following Accounts: 1. The *Sinus* in the back Part of the Skull, as ſhall be ſhewn, for receiving the *Condyles* of the lower Jaw, are larger than the *Condyles* themſelves, by which they have a pretty good Space to move from the Right to the Left; and the Extremity of the *Os Zygomaticum* being their Guard on each Side at the outer Part, which way they move, theſe may be ſuppoſed to yield. 2. The lower Jaw is of ſuch Weight, that it's Muſcles muſt require a great Space to act in, and that may be conciliated by the Motion and Yielding of this Bone. 3. The Grinders of the lower Jaw are much longer than thoſe of the upper, and therefore they require a greater Space to move in, for the better Performance of Maſtication, (becauſe the upper Jaw in this, as in moſt other Animals, is immoveable) to which the Motion of this Bone muſt very much aſſiſt. Add to theſe, the Manner of it's Articulation; for it reſts upon the Production of the *Os Maxillæ* before; and behind it moves, as it were, to and fro, upon the Production of the *Os Calvariæ*, which reſts upon it. Fig. 63.

The back Part *of the* Head.

The back Part of the Skull is next to be conſidered: At it's upper Part the two Eminences, formerly mentioned, now appear more conſiderable, becauſe of the intervening *Sinus*, which from two Inches deep, and ten Inches from the Right to the Left, becomes four Inches deep; for the Eminences (*a. a.*) approach (as they run backward) much nearer to one another; and the *Sinus* running obliquely downward, becomes ſtill deeper, having a *Spina* (*c*) 6 Inches long, and one Inch deep. This *Spina* ſerves for Inſertion of the Muſcles which move the Head. The Bone on each Side of it is very rugous; which ſeems to be an excellent Contrivance, becauſe there is ſuch a deal of Strength required here in the Tendons, for ſupporting the Weight of the Head of this great Animal, 'twas requiſite the Surface of the Bone, whence they ariſe, ſhould be very unequal, that their Fibres may be the more firmly impacted therein. Here 'tis alſo that the *Tax-Wax*, formerly mentioned, was inſerted. By means of this *Spina* in the Middle, and the Eminences on both Sides of the *Sinus*, the Surface of the Bone is much more enlarged, and the Muſcles, with their Tendons, are more capable to move the Head, either directly or obliquely to either Side, than if the Bone had been plain. After the *Spina* of the Fig. 64. Fig. 67.

the *Sinus* is ended, the Bone ſwells out toward the Back Part 3 Inches, and then deſcends 1 ½ Inch, till it comes to the Hole for the Spinal Fig. 64. Marrow (*d. d.*), and here the Bone from above the *Orificium Meatus Auditorii* (*f.*) on each Side, becomes protuberant 10 Inches (*e. e.*), till it comes to the *Proceſſus Condyloides* (*c. c.*). This Protuberance has the ſame Office as the *Apophyſis Maſtoides* in other Animals, *viz.* for Inſertion of the Muſcles which bend the Head inward. The *Proceſſus Condyloides* (*c. c.*) are 7 ½ Inches diſtant incluſive; each of the *Condyles*, being 2 ½ Inches broad from the Right to Left, as they ariſe gradually from their outer Side, and from below to above ariſing (as it were ſemicircularly) 5 Inches long. The Hole for the Spinal Marrow (*d. d.*). at the upper Part, betwixt the *Condyles*, is 3 Inches broad, 2 ½ Inches at the Middle, and two Inches at the lower Part, till at laſt it terminates in a Point. 'Tis 3 ¼ Inches long, and it's Margin about the Middle of the *Condyle*, is 2 Inches thick. Below theſe *Condyles* the Bone becomes more flat; inſomuch, that tending inward there is a *Sinus* framed, above which the *Proceſſus Styloides* ariſes (*g.*), being there articulated *per Synchondroſin*. This *Proceſſus Styloides* is cartilaginous about one Inch (*h*). at it's Baſe; whence ariſing hard and ſolid 4 Inches (*k.*) flat on it's Inſide, and convex on it's Outſide, being one Inch broad, it is afterwards divided, ſending out another Bone 5 ½ Inches long (*i.*), which bending toward the Skull, but outward from that Place whence it proceeded for the Space of two Inches, it becomes gradually ſmaller, till it terminates in a Point not unlike that Part of a Pen wherewith we write. This Bone is ſo ſituated in the *Baſis* of the Skull, that it was impoſſible to give any Idea of it *in Situ*, and therefore I took the Figure of it a-part. Betwixt the *Sinus*, below the *Proceſſus Styloides* and the *Condyles*, at 1 ½ Inch diſtant, is ſituated the Hole for the Jugular Vein (*m. m.*), through which alſo paſſes Fig. 85. the *Par Vagum* (See *n. Fig.* 85.) which being Oval, is 1 ¼ Inch long, and ½ Inch broad. On the Outſide of the *Proceſſus Styloides*, is to be ſeen the Hole for the hard Portion of the *Nervus Auditorius* (*l*). This is ſo near to the Root of the *Sinus*, that it could not be well ſhewn in the Figure. Betwixt the Origin of the *Proceſſus Styloides* (*g. g.*), and the Hole for the Jugular Vein (*m. m.*), is lodged the bony Part of the *Aqueduct* (*n. n.*), which deſcends 5 Inches; 'tis ½ Inch broad, and ſo flat that it could ſcarce be repreſented in the Figure. From thence is a *Crena*, whoſe Orifice is repreſented by (*o. o.*), where it's fleſhy Part was contained, which communicated with the Palate; it deſcends 3 Inches obliquely inward. From the aforeſaid Hole for the Jugular Vein (*m. m.*) is ſituated the Hole for the Carotid Artery, which is ſo large as to admit the Point of one's Little-Finger (*p. p.*). Deſcending in a ſtreight Line from the *Proceſſus Styloides* (*g.*) 3 ½ Inches, you come to the Hole where the *Arteria duræ Matris* enters the Skull, and by which the 3d Branch of the 5th Pair of Nerves paſſes out. Here alſo the Vein, which returns by the great Hole in the *Os Maxillare*, from the *Proboſcis*,

boſcis, (after it has paſt ſome Space beneath the *Lamina* which makes up the upper Edge of the *Sinus* for the Orbit of the Eye) paſſes out, and runs back to be joined with the Jugular Vein. Theſe Holes are ſituated on each Side, betwixt the *Aqueduct* and the *Sinus* for Reception of the lower Jaw (*y.*), and are both received within a like *Sinus*, ſo that they could not be repreſented by an Orifice. The Bone for Reception of the *Proceſſus Styloides*, as I have ſaid, is depreſſed; and from thence, for the Space of two Inches, till you come to the Hole for the Carotid Artery (*p. p.*), it is raiſed from the *Aqueduct* (*n. n.*). From thence, betwixt the two Holes, 'tis gradually protuberant to the *Condyle*: From below this Hole (*p. p.*) ſtreight downward, during the Progreſs of the two *Aqueducts* (*n. n.*), which are 3 Inches diſtant, 'tis depreſſed, till you come to the *Choana*, or Paſſage betwixt the Palate (*t.*) Fig. 62. and the Root of the Trunk (*i.*). Between the two Holes for the *Arteria duræ Matris* 'tis 6 Inches (*q. q.*). The Length of the *Sinus*, called in Human Subjects the *Glenoid* Cavity, meaſuring from that Part of it which is toward the Hole for the *Arteria duræ Matris* (*q. q.*) till you come to the Extremity of the *Os Zygomaticum*, is 5 ½ Inches long. This *Sinus* is ſcarce at all depreſſed; 'tis rather protuberant, with a ſemicircular Surface from above to below: 'Tis well enough guarded on both Sides; ſo that notwithſtanding this protuberant Reception for the *Condyles*, yet their Diſlocation is prevented by the Extremity of the *Os Zygomaticum* on the Outſide (*x.*), and on the Inſide, firſt by an Hollowneſs, and then by a riſing in the Bone. And this Contrivance ſeems to facilitate the Motion of the Jaw very much: for had this *Sinus* been proportionally ſo deep (however ſuperficial it may be) as in Human Subjects, it's Motion had not been ſo very free, as we ſee it is: For by this half-round Surface, the *Condyles* have the more Space to move backward, and the lower Jaw to be depreſſed, that it may move forward, and preſs the Aliment againſt the upper Teeth with the greater Force; the Muſcles alſo prevent it's falling too much back, and the *Os Zygomaticum* it's inclining too much to either Side, as is obſerved. Above the big Proceſs of the *Os Maxillæ*, which is articulated with the *Os Zygomaticum*, is the *Orificium Meatus Auditorii* (*k*), which being Fig. 63. Oval, is one Inch long, and ½ Inch broad. Betwixt this external Orifice and the *Proceſſus Petroſus*, the *Meatus* is 8 Inches long; whereof hereafter. By means of this great *Sinus* on each Side, the *Baſis* of the Skull is ſo contracted, that from the Hole (*q*) down toward the Root o he Teeth (3, 4.), which is 9 Inches long, the Breadth is but 7 ½ Fig. 64. I es. From the Extremity of the bony Part of the *Aqueduct* d nward, the Baſe of the Skull is compoſed of cavous Bones, a t 2 ½ Inches thick, and a large *Sinus* in the Middle 3 ½ Inches Dian er (*S.*) at the End of the *Sinus* for the fleſhy Part of the *Aqueduct*, a d at the Root of the Teeth 4 ½ Inches. This *Sinus*, after 'tis bec ne 2 Inches deep, terminates in the *Choana*. This Paſſage is 8 I es long, and 2 ½ Inches broad, with the *Vomer* in the Middle (*u.*) e ding from hence to the Root of the Trunk 8 Inches. The back

Part of this *Vomer* is ſharp and thin, but it's fore-part thicker, conſiſting of two *Laminæ*. Dr *Moulins* is of Opinion, upon Obſervation of the Tongue, that the *Elephant* only breathes by this Paſſage, and not by the Mouth. I do not find that this Paſſage is proportionally more patulent in this Animal than in any other, only it ſeems to be more direct; for as in other Animals this Hole communicates with the Root of the Noſe, and the Bone gives the Air at it's Exit another Direction; ſo here the fore and back-part of the *Choana* are directly oppoſite: but then the Trunk itſelf gives the Air a quite other Direction than in the Bones of other Animals. Indeed there is one Argument which ſeems to ſtrengthen Dr *Moulins*'s Opinion, *viz.* That by the Trunk the *Elephant* ſucks up any Liquor it has Occaſion for, which it afterwards empties into the Mouth; and ſo by drawing in of the Air, it is able to keep in it's Extremity any Thing it takes hold of. However, the Objections advanced againſt this Opinion formerly, ſeem to be of greater Moment than theſe Arguments here propoſed are for it. Theſe two cavous Bones, on each Side of the *Choana*, are filled up from the two firm, ſolid, white, weighty Teeth (3, 4.) the back one whereof does not grind, but ſerves as it were a Wedge to keep that before firm in it's Place (5.). This Tooth runs obliquely backward 3 Inches from the fore Tooth. That Part of it which is without the Jaw-Bone is half-round, being 6 Inches in Surface from it's Root on the one Side to that on the other, very polite, as *Tentzelius* is pleaſed to term it, and ſmooth like Glaſs. How far this Tooth or the other may go up I cannot poſitively determine, neither give any Account of the Figure within the Bone, unleſs I had broke the Skull. However, I ſhall inſiſt more upon the Teeth when I come to the lower Jaw; all I ſhall add at preſent, is, that their *Alveoli*, eſpecially that which contains the hind Tooth, are as thin as can be imagined. The Length of each of the Teeth is 7 Inches. Theſe Teeth are not alike on both Sides; for that on the right is but one Inch without the *Alveolus*, throughout it's whole Extent on the outer Side; and on it's inner, 'tis one Inch protuberant at it's fore, and two Inches at it's back-part; whereas that on the left Side is only one Inch protuberant before on the Outſide, and three Inches behind, where it forms a Kind of Angle, as it is joined with the hind Tooth; and on the Outſide 'tis ½ Inch protuberant before, and 2 Inches behind. The Tooth on the right Side (2.) grinds with that of the lower Jaw, throughout it's whole Extent; whereas that of the left, after it has run back 6 Inches, runs up with an half-round Surface 2 Inches (5.) before 'tis joined with the hind Tooth. It would ſeem that this Difference betwixt the Shape, Situation, and Dimenſions of the right Tooth from the left is not ſingular here; for Dr *Moulins* doth likewiſe take notice of it, in that which died at *Dublin*: for he ſays, 'The Length of the Teeth of the right upper Jaw 'is 4 Inches, but that of the oppoſite was but 3: The two outward 'or fore Teeth of the upper Jaw were ſomewhat longer than thoſe

Teeth, *or Grinders of the* **upper Jaw. Fig. 64.**

‘ of the Under.’ He takes no notice whether the hind Teeth of the upper Jaw grind or not: But here (as I have ſaid) not only both the hind Teeth are free from grinding, but alſo part of the fore Teeth of the Left Side. Theſe Teeth, as Dr *Moulins* well obſerves, are all *Molares*, being 2 Inches broad; that Part of them wherewith they grind is 6 ½ Inches on the Right Side, and 5 ½ on the Left. Their Surface, tho' flat, yet is very unequal; for they have alternatively placed (running from the Right to the Left) an Hollowneſs, and then an Eminence, and this Eminence is ſurrounded by a rough protuberant Border. There are nine of each of the Hollowneſſes, and as many Eminences, undulated, as they uſe to paint Sea Waves; which ſeems to quadrate with what Mr *Ray* ſays, *viz.* ‘ That theſe Teeth have 8 or ‘ 9 parallel undulate Lines in their Surface.’ The Situation of theſe Teeth, for what I know, is peculiar to this Animal; for inſtead of running from above to below, as in other Quadrupeds, they run from before to behind, as in human Subjects, being placed at ... Inches Diſtance at the beginning or fore-part, and ... Inches at their hind-part. From the fore-part of theſe Teeth the *Os Palati* runs down ... Inches, having that Diviſion in the Middle (whereof formerly) much enlarged (10.). This Bone, as to it's Thickneſs in this Subject, is correſpondent to the Tuſks, which are implanted in each ſide of it (as is ſaid). It ſeems to be thus placed, upon two Accounts: 1. That it may anſwer to the Diſtance, or cover that Part of the lower Jaw which runs betwixt the fore-part of the Grinders above (*c. c.*) and the Proceſs at it's lower and middle Part (*e.*). 2. That it may afford Space, as we formerly obſerv'd, Fig. 68. for the Trunk to reſt upon, leſt it ſhould be obnoxious to the Mouth.

The Lower Jaw.

The lower Jaw is the only External Part of the Head, which comes now to be conſider'd, conſiſting of one big Bone, and compoſed of it's fore and hind Part, and five Proceſſes, *viz.* two *Condyles (a. a.)*, two Fig. 68, 69. *Proceſſus Coronæ (b. b.)*, and one *Proceſſus Menti* (*e*); 'tis articulated with the upper Jaw, as in all other Animals, by a double *Arthrodia*. The two *Condyles (a. a.)* are 12 Inches diſtant incluſive; their Surfaces convex both from the Right to the Left, which is 3 ½ Inches, and from before to behind, which is 2 Inches. They are received into the *Sinus* of the upper Jaw (*x.*), which, as I have ſaid, is 5 ½ Inches: So that Fig. 64. they have Space enough to move at Maſtication. The Neck, below the *Condyle*, is 3 Inches from before to behind at it's ſmalleſt Part; whence deſcending 3 Inches, it becomes 6 Inches broad (*b.*), and 2 Fig. 69. Inches thick at it's back-part, where it forms an obtuſe Angle; whence running forward at it's outer Side 2 Inches, it begins to form a *Sinus* for Inſertion of the Muſcles which move the Jaw. This *Sinus* running forward 4 Inches more, terminates in a ſharp Edge of the Bone, which deſcends to make up the *Proceſſus Coronæ (b. b.)*. This *Sinus* is 8 Inches from above to below: At the upper-part of the *Proceſſus Coronæ* 'tis 8 Inches broad from before, where 'tis ſharp, to behind, where 'tis thick and obtuſe; and at it's middle 9 ½ Inches (*b. b.*) the

Fig. 70. the *Proceſſus Coronæ* from above to below 6 Inches, with, as it were, a ſemicircular Edge, but ſomewhat more protuberant, where 'tis not ſo ſharp as the Margin above. Now we come to the inner Side of the ſame Part of the Bone, where we find that deſcending 7 Inches Fig. 69. from the *Condyle*, 'till we come a little below the foreſaid obtuſe Angle, there are the Beginnings of a large Hole (*b. b.*) 3 ½ Inches long, *viz.* from the firſt framing of it's *Sinus* to it's lower Part, and 1 ⅙ Inch broad. This Hole is for receiving the Veſſels fit for forming and nouriſhing the Teeth, whereof hereafter: Here the Jaw begins to be about 4 Inches thick behind, being convex in it's back-part; whence running 4 Inches forward, it inclines about 2 ½ Inches inward, where it forms a large *Sinus* for Inſertion of the *Muſculus Maſſeter*, and whereof no *Idea* could be given in the Figure; for the Outſide always obſtructed the View of the Inſide. This *Sinus* deſcends obliquely from the Neck of the *Condyle*, till it comes to the Root of the Teeth (*c.*) 9 Inches, which Space does not appear ſo large in the Figure, becauſe of the Poſition of the Jaw; and from the fore-part of the *Coronæ* backward, till the Jaw become thick, 5 ⅓ Inches: From the back Part of the Jaw at the aforeſaid obtuſe Angle, till you come to the Point of the *Proceſſus Menti* (*b.*) in a ſtraight Line, is 27 Inches. The Arch of the back Surface from the ſame Angle, till you come equal with the Beginning of the Teeth, or lower Part of the *Coronæ* (*c.*), is 14 ½ Inches, from whence meaſuring outward from the Root of the Teeth, it is 3 Inches to the aforeſaid lower Part of the *Coronæ*; from thence to the middle of the back Part 5 Inches; and from the Root of the Teeth at the External to the ſame Place at the Internal Part, is 16 Inches; and here the Jaw is about 4 Inches thick behind. At the joining of the two Teeth ſtraight downward, 'tis 6 ½ Inches; and here it inclines gradually outward for above 9 Inches; whereas it's inner Surface is almoſt plain, or at leaſt for the Space of 4 Inches, and then inclines 3 gradually outward below, forming an Arch in it's Progreſs. Straight downward from the loweſt Part of the *Coronæ*, the Jaw is at the thickeſt (*c.*), and here it begins to run obliquely forward, till meeting with the ſame Part of the Bone from the other Side, it terminates in Proceſſus Menti. Fig. 68, 70. the *Proceſſus Menti* (*b. Fig.* 70. *e. Fig.* 68.), which about 2 Inches runs obliquely outward, and ſeems very convenient for defending the Mouth from the Inconveniencies of the Trunk; which by it's Weight would preſs too much upon it, were it not defended both by that Part of the *Os Palati*, which runs down from the Teeth in the upper Jaw, upon which it leans; and by this *Symphyſis* or *Proceſſus Menti* (*b. e.*), which keeps it ſtill inclining downward, and ſuffers it not to bend inward: Add alſo, that this Proceſs may aſſiſt the *Proboſcis* ſomewhat in it's Elevation, when the Animal bending the Head a little forward, may make the Point puſh or bear up the *Proboſcis* from above it. As the lower Part of the Jaw in it's Progreſs forward, runs obliquely downward, ſo it's upper Part of the Root of the Teeth runs ſtraight forward, or rather inclines a little upward (*c.e.*), ſo that whereas 'tis only 6 ½ Inches from above to below at the joining of the Teeth, now 'tis 7 ½ Inches ſtraight downward, (and here it's Surface is more plain, for before 'twas convex, and, as it were, half round) but all along the Edge of the *Sinus* for lodging the Tongue (*d. e.*), to the outmoſt Point of the *Proceſſus Menti*, 'tis 9 Inches Now we conſider the inner Part from the Place where we left it, and find it ſtill more plain; where meaſuring from below the foreſaid joining of the two Teeth ſtraight forward, 'tis 4 Inches on each Side, till both meet in a Semicircle (*f.*), about 3 Inches Diameter at the lower Part, and ſomewhat nearer at the Root of the Teeth. After it has run 2 Inches upward, it runs ſtraight forward with a convex Surface 4 Inches thick; thence it aſcends 4 Inches more to the Root of the Teeth (*d.*). This *Sinus* is for lifting the Tongue, which is very narrow and pointed. Thus having given a particular Account of the External Figure and Shape of the lower Jaw, we ſhall conſider it in general. The *Condyles* are 12 Inches incluſive diſtant; whence the Bone running downward, and ſomewhat backward 3 Inches, forms an obtuſe Angle which is 17 Inches excluſive diſtant from it's oppoſite; and here the Bone begins to ſwell to a conſiderable Thickneſs by Degrees: From thence deſcending gradually 8 Inches, 'tis 18 Inches diſtant; thence inclining obliquely forward 8 Inches more, 'tis 14 ½ Inches diſtant; inclining ſtill more forward to the Baſe where the two Bones meet, the Bone ſtill becoming thinner 'tis 9 Inches; from which on each Side, till you come to the *Proceſſus Menti*, 'tis 7 Inches: thus far as to his back-part. Now to it's fore-part: Firſt, there is the *Condyle* (*a. a.*), then there is a ſharp Spine which runs obliquely to the *Coronæ* (*b. b.*), whence to the Root of the Teeth 'tis thicker, and of a ſemicircular Form: Oppoſite to this, the Bone begins to ſwell at it's outer Side, and becomes plain at it's Inner; that is to ſay, as to that which regards the Mouth, and that which doth not. It's Surface on both Sides is very polite and ſmooth, having a great many Holes for Immiſſion and Egreſs of the Blood-Veſſels, which nouriſh the Bone; and at it's fore-part, it has two large Holes for the *Maxillaris inferior* (Z. A.) or Branch of the 5th Pair of Nerves, which are diſperſed at the Roots of the Teeth. Next we come to the inner Subſtance of the Bones, ſo far as can be gueſs'd, becauſe the preſerving of the Skeleton entire, has kept me from penetrating ſo far into the Knowledge of it, as my Inclination n ,ht have led me. Every one is ſenſible, who knows any Thing in O ·logy, as well Human as Brutal, that immediately below the *Coronæ*, o ereby, there is a pretty large Hole in Proportion to the Animal, f the Emiſſion of a Branch of the External Carotid Artery, Jugular V n, and 5th Pair of Nerves, call'd *Maxillaris inferior*, which are diſp ed in the Roots of the Teeth for their Nouriſhment, and for concilia g to them that lively Idea of Pain, which thoſe affected with the T th-Ach are very ſenſible of; and that in this Hole in Sheep, Calves,

Fig. 68.

Fig 68, 69.

Sinus *for lodging the* Tongue.

Fig. 69.

Fig. 70.

Fig. 70.

Fig. 61.

Maxillaris inferior.

The Rudiments *of the* Teeth.
Fig. 69.
Fig. 90.
Fig. 70.

Calves, and other Quadrupeds, eſpecially ſuch as are young, as alſo in Children before the 7th Year, and even afterwards for ſome Time, in the cavous Part of the Bone, where the Teeth do not penetrate the Jaw, there are Rudiments of Teeth to be ſeen cavous in that Extremity, which is toward the Baſe (in which the Ligaments that keep the Root fix'd are firmly impacted) and ſolid at the other Extremity; ſo in this Animal from the fore-mentioned big Hole, I obſerved ſeveral of theſe Rudiments of Teeth lying *Stratum ſuper ſtratum*, or rather plac'd perpendicularly acroſs the Bone of each other's Side, from the Hole, (*b. b.*) till the Teeth began to appear. Thoſe that were placed neareſt the Hole were ſmaller, not above 1 Inch in Breadth, and ½ Inch in Length, *i. e.* from above to below, cavous, as is obſerved, at the lower or back-part, (for Reception of the Ligament, which is guarded by two thin hard *Laminæ*) and ſolid at the other. Thoſe neareſt the Hole were two or three Times interſected by Membranes, whereby they could be disjoined. But after I had taken out ſeveral, I found no more ſuch a Separation, but that from the Right to the Left they were wholly cavous: Each of them was inveſted by a membranous Tunicle, as it were a *Perioſteum*, and had ſomething like a cartilaginous Subſtance betwixt the two. Their Surface is very unequal at the Orifice where they receive the Ligaments and Veſſels (*c.*), and as if they had been folded into ſeveral *Plicæ*, and afterward taken aſunder, from which there run ſeveral Ridges and *Sulci* (*b.*), from one Extremity to the other; where the Ligaments ceaſe, they become extreamly ſolid and ponderous, and at their upper Extremities half round, and ſometimes formed into Digitations (*a*). When they approach to that Part of the Bone at which the Teeth appear, they begin to quit the *Perioſteum*, by which they were diſtinguiſhed, and unite cloſe together, ſo as to form one Bone. 'Tis obſervable, that at their upper Extremity there is a *Lamina*, which being convex toward the Jaw, and concave toward theſe Rudiments of Teeth, does, as it were, knit their ſolid Extremities together, from which 'tis alſo ſeparated by an intermediate Membrane at the Beginning; but afterward that ceaſing, this *Lamina* conjoins them at the Extremities, as they are at the Sides, before they appear without the Jaw. And thus I conceive theſe Teeth to be formed, and 'tis by theſe I am perſuaded the Jaw becomes ſo ponderous and thick; and that which ſtrengthens this Opinion is, that the hind Teeth of both Jaws (for I doubt not but theſe *Rudimenta Dentium* are in the upper Jaw alſo) before they come to grind, have their upper Parts ſemicircular; and that both before and after the Grinders are formed, the Lineaments of theſe *Rudimenta* appear plainly like ſo many Ridges (*d. e.*), having intervening Furrows, where they formerly had been diſtinguiſhed by Membranes: And I ſuppoſe, tho' at the upper Extremity they are united into one compact Bone, yet at their lower Extremity they have ſtill the ſame Hollowneſſes for Reception of the Ligaments and Veſſels as formerly; which Opinion is confirm'd by *Tentzelius*'s Account. The lower Jaw has 4 Teeth, 2 on each Side (*d. e.*) as well as the Upper, all Grinders, but no Inciſors, or fore Teeth. The hind Teeth are 8 Inches diſtant, and the Fore Teeth. not 4, betwixt which is placed the *Sinus* for the Tongue (*d. e.*) and 'tis obſervable, that from thence to the Bottom the *Sinus* is ſo contracted, as only to be one Inch broad (*f.*). The hind Tooth on the Fig. 68, 69. Right Side is 4 Inches, on the Left 5. The one half of their Surface, where they begin to appear, is ſemicircular, with the fore-mention'd Ridges and *Sulci* running tranſverſely, 4 on the Right Side, and 5 on the Left. The other Half has 5 of thoſe Eminences, where it grinds, (whereof formerly, when ſpeaking of the upper Jaw) and 4 on the Left. Each of the fore Teeth is 6 Inches long, and has 6 or 7 of the fore-mention'd Eminences, and as many Depreſſions. The hind Teeth of Dr *Moulins*'s Elephant ſeem to have been of an equal Length on both Sides, and much longer than the fore Teeth. 'Tis obſervable, that the Ridges at the Sides are correſpondent to the Eminences where they grind, and the *Sulci* to the Depreſſions. The Teeth of the lower Jaw exceed thoſe of the Upper about 2 Inches in Length; by which it appears, that the Motion of the lower Jaw muſt be very great in Maſtication, and that the *Elephant* for the moſt Part moveth the Jaw from behind to before; and ſcarcely from one Side to the other, as in Animals, that ruminate, or chew the Cud. Theſe Teeth are the moſt firm, ſolid, and weighty Bones of any Animal yet known, and are as good Ivory as the Tuſks themſelves. Before we quit the lower Jaw, I hope it will not be impertinent to enquire, whether or no theſe *Rudimenta Dentium* may be ſuppos'd in Proceſs of Time to deſcend and expel thoſe Teeth already form'd, and ſucceed in their Place; and if not, what may be their Uſe. For the firſt Queſtion, 'tis true, Children have two Ranges of Teeth, tho' not equally ſolid, the ſecond whereof expels the firſt at or about 7 Years of Age, and ſucceeds them, the firſt being only for ſo many Sheaths or Covers, whereby the ſecond, being yet but a ſoft mucilaginous Subſtance, are defended from external Injuries, till in Proceſs of Time they have attain'd to a convenient Hardneſs; and that there is a great Difference in the Teeth of ſome Quadrupeds, ſuch as young Horſes, whoſe Fole or Colt Teeth, as they are call'd, have ſome Marks, which are obliterated after a certain Period of Years; ſo that it would appear, if theſe Teeth are not expell'd, yet their Surface by Degrees is abraded, and inſtead of that their Roots are augmented, and the Teeth receive ſuch an Alteration, as their Age is no more known by theſe Marks. I have already obſerv'd, that there are ſeveral Ridges and Furrows in the Teeth of this Animal, which ſeem to be an Evidence, that theſe *Rudimenta* have grown together and become one Tooth; but whether the *Rudimenta*, which have not as yet appeared without the Jaw, do ever expel theſe which have appeared, and ſucceed them, is the Queſtion; no Experiment yet being made concerning the Production of thoſe in this

The Teeth, or Grinders *of the* lower Jaw.

Animal. The Period of the Time that *Elephants* live, and the Age of this we treat of being unknown, we can give no poſitive Determination in this Matter: Yet I am apt to believe, theſe Teeth as well as the *Rudimenta*, have been *à prima formatione*, and that becauſe, 1. The Jaw-Bone ſo firmly adheres to the Teeth on both Sides, ſo ſoon as they appear, and the Place of their Roots is ſo well known (by the Protuberance on the Outſide of the Jaw) to be enlarg'd within the *Alveoli*, that I do not ſee how they can be expell'd by a ſucceeding Set. 2. When one Set of Teeth expels the other, the ſecond is uſually below the firſt, and not placed in the ſame Rank, as theſe are; which obliges me to enquire, what may be the Uſe of theſe *Rudimenta*: Which I ſuppoſe to be, 1. To fill up the Cavity of the lower Jaw. 2. By their Weight to add Strength in Maſtication. 3. That there may be ſo many different Bones to aſſiſt the Teeth in their Motion: And 4thly, To ſerve inſtead of a Wedge for keeping the Teeth firm in their Place. For the firſt, 'twas convenient the lower Jaw ſhould bear an equal Proportion in it's Bigneſs to the Upper, and have ſufficient Space for Inſertion of the Muſcles fit for it's Motion; and if of a proportionable Bigneſs, then either the Bone muſt be altogether ſolid, or cavous, and ſtuffed with ſome other ponderous Subſtance; for if ſpongy or cellulous, then would it have been too light, which would have been very inconvenient. As to the ſecond, the Weight is of conſiderable Moment, for the more exact Attrition of the Aliment, which is here requiſite, becauſe the Tongue of this Animal is both ſmall and polite on it's Surface, without thoſe ſharp cartilaginous *Papillæ* thoſe Animals are endued with, whoſe Teeth are not ſufficient to grind their Food. As to the third, I conceive that theſe *Rudimenta*, with their intermediate Membranes, may be the more helpful to the Teeth in their Motion (if they have any) or Preſſure, than if the ſurrounding Jaw had been one whole continued ſolid Bone. For the fourth, hard and ſoft Subſtance alternately placed, is certainly more convenient for keeping any thing firm than either of the two alone; for had they been hard Subſtances that lay upon one another, then neither would yield to Preſſure; and if ſoft, tho' they yielded, yet would they not ſo well retain the Preſſure they receive, and keep any thing firm thereby, as if they had ſome intermediate Subſtance: In a word, be the Uſe of theſe *Rudimenta* what it will, the Teeth and they together have render'd this ſo ponderous as to amount to 45 lb. Weight. And thus we have ended the external Parts of the Head.

Inner Parts *of the* Head.

Being come to the internal Parts of the Head, we ſhall proceed as in Treatiſes of *Oſteology*, by taking notice of it's Structure, two Tables, *Diploe*, Figure, and Extent of the inner Table, *Foſſæ*, Eminences, and *Foramina*; of all which in their Order. As there is no Animal in Proportion that is endued with a greater Quantity of Brains than Man, ſo there is none that ſeems to have leſs than the *Elephant*. In the one, 'twas ſo order'd by the Wiſe Governor of all Things, that they might be ſufficient for the Generation of ſo many Spirits, as are requiſite for the Performance of the Rational and Animal Functions; and in the other, had the Quantity of Brains been greater, the *Principia Nervorum* had been more divided; ſo that inſtead of being requiſite, they had been vaſtly inconvenient, becauſe the Nerves cou'd not ſo well receive the Spirits diſpers'd in a greater Maſs, as now, when contracted within leſſer Bounds: And ſuch a Contrivance as this being requiſite, the interpoſing of ſuch a vaſt Diſtance betwixt the two Tables of the Skull, as we ſhall come to give an Account of, is a ſtupendous Piece of Mechaniſm.

Fig. 62.

Cellules *of the Head.*

Fig. 65.

As we before obſerved, in the Bottom of the Hole for the Root of the Trunk there are ſeveral *Laminæ* (*b. b.*) to be ſeen. Theſe *Laminæ*, taking their Origin from hence, run backward in a parallel, and ſometimes oblique Line, to the ſecond Table of the Skull, or that Part of it which inveſts the Brain: And theſe *Laminæ* being either horizontally, perpendicularly, or obliquely placed, meet with, and interſect each other, forming intermediate Cavities or *Cellules* (*d. d.*) of different Magnitudes, Poſitions, and Figures, according to the Intergerine Walls or Sides, whereof they are compos'd: So that altho' Dr *Moulins*, and after him *Tentzelius*, ſeem to aſſert, that they were for the moſt part triangular, yet I have obſerv'd them quadrangular, pentagonal, hexagonal, and rectangular, and even ſometimes irregular. Theſe Cells run, as I ſaid, from the outer Table, or external Parts of the Skull (*a. a.*) to the inner Table or Seat of the Brain (*b. b.*) and communicate with one another by pretty large Holes, either toward the inner or outer Table, and ſometimes two meeting together in the Middle, frame a third. In a word, as there is no certain Rule obſerv'd in their Figure, ſo neither is there any in the Communication. The Diſtance they fill up between the two Tables before is 11 Inches, at the Side 8 Inches, toward the Back-part but 3 Inches, and at the Hole for the Spinal Marrow (*o.*) both Tables meet together; for the Brain is placed in the Lower and Back-part of the Skull (*Fig.* 66.). All theſe *Cellules* were empty, and only obduced with a thin Membrane. And here I cannot but take notice of what Dr *Moulins* obſerves, namely, That there are ſeveral Blood-Veſſels pleaſantly diſſeminated throughout the Surface of theſe *Cellules* with different Divarications; and *Tentzelius* ſays, he obſerv'd ſeveral Linaments of Veſſels after the ſame Manner. This was not to be obſerv'd in ours at all, nor ſo much as the *Veſtigium* of a Veſſel to be ſeen; the Reaſon whereof, I ſuppoſe to be this: When the one was burnt in *Ireland*, and the other overwhelm'd with Earth in *Germany*, both ſuffering violent Deaths, could not but have vaſt Strugglings and Wreſtlings, ſuch as Dr *Moulins* ſays his had, and ſuch as *Tentzelius* ſuppoſes that in *Germany* to have had alſo. By theſe violent Motions, the Blood could not but be propell'd with a vaſt Force from the greater Trunks to the ſmaller Capillaries, where it diſtended the Veſſels, and render'd them ſo perceptible to the View after the Death of the Animal; whereas this we treat of, having labour'd of a languiſhing Diſtemper for ſome time, as appears by the *Polypus*'s found in the Heart and other Veſſels, the Blood could not but be very languid, and ſcarce convey itſelf to theſe Capillaries: So that the Sides of the Veſſels being collaps'd, they were render'd imperceptible: But that which is more remarkable is, that not ſo much as any of the *Sulci*, which theſe Veſſels might have made in the *Laminæ*, do at all appear; and yet the *Sulci* were ſtill very evident in the Bones found in *Germany*, with the Blood-Veſſels containing the dry Blood ſtrictly glued to them, and chang'd into a yellowiſh Colour, and that perhaps after Thouſands of Years, as the ſame Author obſerves. Indeed upon viewing more narrowly the *Cellules*, I find all of their *Laminæ* endued with ſmall Holes of an indefinite Number, and irregularly placed, thro' which theſe Veſſels ſeem to have paſs'd from one *Cellule* to another: So that tho' not ſo obſervable, yet no doubt they have been diſpers'd thro' them in this as well as in other *Elephants*.

Uſe of the Cellules.

We come next to enquire what may be the Uſe of the *Cellules*. There have been ſeveral Opinions advanc'd about them; as, 1ſt. That ſince the *Elephant* has been obſerv'd to ſuck up a great deal of Water by the *Proboſcis*, that the Water, perhaps, is received into theſe *Cellules*, becauſe of the Communication they ſeem to have with the *Proboſcis*, and that thereby they cool their Brain in hot Countries, where they abound. 2. That ſince the *Elephant* has a very acute Senſation of Smelling, they think the *Nervus Olfactorius* is diſpers'd (after it has paſs'd the *Os Ethmoides*) throughout the fine Membranes that obduce the *Laminæ*, which deſcribe theſe *Cellules*. 3. That theſe *Cellules* being interpos'd betwixt the two Tables of the Skull, they only ſerve to keep the Head from being too weighty. As to the firſt; admit the Water could be receiv'd into theſe *Cellules*, which from their Poſition at the Root of the Trunk, 'tis plain they cannot, there being no muſcular Subſtance to expel theſe Waters, we cannot ſuppoſe this is their Uſe. As to the ſecond; the *Nervus Olfactorius*, after it has paſs'd the *Ethmoides*, does not at all communicate with theſe *Laminæ*, but penetrates the *Os Vomeris*, whence the *Cartilaginous Septum* of the *Proboſcis* ariſes: So that theſe *Cellules* can be no ways aſſiſting for that End, the Senſation of Smelling being chiefly perform'd in the *Proboſcis*, and not by the Fibres of the *Nervus Olfactorius* diſpers'd in theſe *Laminæ*, which are quite otherwiſe diſpos'd here, than in Men, Dogs, *&c.* whoſe *Laminæ Spongioſæ* are ſo ſituated in the Root of the Noſe; ſo that the Air muſt touch them before it reach the *Os Cribroſum*; whereas here the *Laminæ* are ſo ſituated, that the Air touches the *Nervus Olfactorius* as ſoon as it can touch them. The third is to me more probable, and Dr *Moulins* is of the ſame Thought, and that upon ſeveral Accounts; ſuch as the Conſideration of the ſmall Extent of the Seat of the Brain, to which had the reſt of the Head been correſpondent, it would have had no Proportion to the Body; nor could the Muſcles, fit for moving the Head, have ſufficient Space for their Inſertion, nor the *Proboſcis* for it's Origin; ſo that there was a Neceſſity for interpoſing ſome Diſtance betwixt the inner and outer Table of the Skull. Now this Diſtance muſt be fill'd up with ſome intermediate Subſtance, and had that either been carnous or oſſeous, whether ſpongeous or ſolid, or (as ſome think the *Sinus Frontales, Maxillares, & Baſilares* in human Skulls are) mucous; ſhould either of theſe have occupied ſuch vaſt Bounds, the Head would have been render'd too weighty. Therefore it is wiſely order'd by Providence, that there ſhould be only thin *Laminæ* of Bones, ſo diſpers'd, that the outer Table of the Skull may be more ſtrengthen'd for ſupporting the Weight of the Muſcles of the Head, lower Jaw, and *Proboſcis* adhering thereto, that it may have a Communication with the inner Table, and that the Space betwixt theſe *Laminæ* may be empty; leſt by any intermediate Subſtance, the Head had been too heavy, as is ſaid, and the inner Table ſo burthen'd as to preſs too much upon the Brain, which might have diſturb'd the *Oeconomia Animalis.* Analogous to this Structure we find in Oxen, which have the ſame *Cellules* betwixt the two Tables of their Skull, eſpecially toward the Horns, whoſe Flints, as they are call'd with us, or the bony Subſtance, whereby that Part of the Horn which is toward the Head, is fill'd, is likewiſe cellulous, leſt by their Weight, together with that of the Horns, they ſhould prove uneaſy to the Head: But leſt by reaſon of theſe Vacuities, which are all placed in the Upper and Fore-part of the Head of the *Elephant,* (for the Brain and *Elevatores Capitis* are ſufficient to depreſs it's Back-parts) it ſhould be render'd ſo light, that it could not be equally pois'd or kept ſteady, the Teeth, both in the upper and lower Jaw, are render'd thus weighty to counterballance it.

Inner Surface *of the* Skull.

Fig. 85.

We come next to conſider the inner Surface of the Skull, where the Brain is lodg'd; 'tis in Figure like an Human one, but more ſpherical, being from the Right to the Left 10 Inches, from before to behind 9 Inches, and from above to below at the *anterior Foſſa* 7 Inches, betwixt the Middle 5 Inches, and at the *poſterior,* or Seat of the *Cerebellum,* 4 ½ Inches. It has 4 *Foſſæ,* and 5 Eminences. The *anterior Foſſa (b. b.)* is circumſcrib'd by the Fore-part of the inner Table of the Skull before, and by the two *anterior* Eminences *(c. c.)* behind. Here the Brain ſends forth it's greateſt Production; for at the Hind-part this *anterior Foſſa* is depreſs'd ſtraight down near 2 Inches, where the *Os Ethmoides* begins, which is of a ſingular Figure and Structure; for from the Fore-part of the Seat of the Brain in the Middle, there is here, as in moſt Skulls, an Eminence which runs obliquely downward, till it begins to form the *Criſta Galli (d.),* ſo call'd in human Subjects. This *Criſta Galli* divides the *Os Ethmoides* into it's right and left Part; 'tis pretty thick and broad at the Baſe, whence it ariſes from each Side, till it begins to form a *Crena,* which is perforated by 3 Pair of Holes;

and then there ariſes a ſmall *Spina* in the Middle (*d.*); at the fore Extremity whereof, it being further extended than the *Ethmoides*, there is another Hole. From this *Criſta Galli* run on each Side ſeveral prominent convex Lines, ſome obliquely forward, others obliquely backward, others tranſverſely; each of which is branch'd out twice or thrice toward the Circumference, which 'twas impoſſible to expreſs very lively in ſo ſmall a Figure. Theſe Lines have ſome few Perforations running from their higheſt Part, but moſt of them are betwixt their Interſtices, where they are pleaſantly diſpers'd after ſome Kind of Order, which alſo we could not expreſs in the Figure. Os Ethmoides. The *Os Ethmoides* is not unlike a Heart, as they uſually repreſent it, being narrower at the Hind-part, where the *anterior Foſſa* runs ſtraight down from the Fore-part of the *Sella Turcica (u.)*, and broader at the Fore-part of the Bone, which runs obliquely upward from it; 'tis from before to behind 3 ½ Inches, and from the Right to the Left 4 Inches: It's Circumference is not altogether circular. The Speciality of this Structure gives Ground to enquire into it's Reaſon, and the acute Senſation of Smelling, wherewith, according to all Authors, this Animal is endued. In moſt of other Animals, neither is this *anterior* Production of the Brain ſo great, the Perforations of the *Os Cribroſum* ſo many, nor it's Extent ſo large: But in Animals of an acute Smelling, beſides the Perforations of the *Os Cribroſum*, there are ſeveral ſpongeous *Laminæ* which ariſe from it's lower Part; each whereof is endued with Tunicles, wherein are variouſly diſpers'd ſeveral Branches of the *Nervus Olfactorius*; and theſe *Laminæ* are ſet very near to one another, as it were the Teeth in a Comb, or the *Lamellæ* in the lower Part of ſome Muſhrooms. Both the Contrivance of the *Laminæ* and their thick Diſpoſal, are very uſeful for Senſation; for whereas had this *Nervus Olfactorius* been ſtill in one Trunk, the Volatile Saline Particles would have only acted upon ſuch Filaments as compoſe the Surface; whereas the Nerve being variouſly diſpers'd into divers Branches, and theſe Branches differently diſpos'd into ſeveral Surfaces, 'tis capable to receive Impreſſion from as many Saline Particles, as there are different Branches and Surfaces, whereinto theſe are diſpos'd: Add alſo, that the ſharp Edges of theſe *Laminæ* being toward the Air, they are more capable to divide the *Columna Aëris* ſuck'd in by the Noſe, and give a greater Tenſion to the nervous Filaments diſpers'd in them; whereby the Senſation is communicated the more lively to the *Senſorium Commune*; and 'tis obſervable, that ſuch Creatures as have moſt of theſe *Laminæ* have their Smelling the more acute. Now this Structure is only to be ſeen in thoſe Animals, whoſe *Septum Intermedium*, and two Sides of the Noſe, conſiſt of Bones, at leaſt ſo far as their *Laminæ* are extended; but it fares otherwiſe with our *Elephant*, whoſe *Os Ethmoides* is very thin, and has no *Laminæ Spongioſæ* adhering to it's Outſide, nor a Bone for the *Septum*, or Sides to guard theſe *Laminæ*, which would have been inconvenient; for then the *Proboſcis* could not have mov'd with the ſame Facility, even from it's Root, as it doth. Therefore to ſupply this Defect, and ſtill to continue the ſmelling ſo acute, if not more in this than in many more Animals, 'tis provided, that the *anterior Foſſa* ſhould be very deep, that the Production of the Brain in it might be the greater; and leſt it's Surface ſhould ſtill be too ſmall, there ſhould be eminent Lines both in the *Vomer* and throughout the reſt of the Bone, that there might ſtill be more Space for branching out the Nerve, as it proceeds from it's Origin. There may alſo be another Reaſon alledg'd for theſe Protuberances, *viz.* becauſe the Brain is more pendent here than elſewhere, they may ſerve as ſo many Columns to ſupport it, leſt by it's Weight it ſhould lean too much upon the *Os Cribroſum*, ſo that the Origin of the *Nervus Olfactorius* being too much preſs'd, inſtead of a clear, might afford a very confus'd Idea of Smelling, and, that even within the Skull it may be ſo divided and diſpers'd in this Animal, as it is uſed to be without it in others: So that the Defect of the *Laminæ Spongioſæ* without, is ſupplied by this Diverſity of Perforations and Eminences in the *Os Cribroſum* within. Indeed in Horſes there is ſomewhat of this Structure to be obſerv'd: The *Os Cribroſum* ſeems to be proportionally as large; it's Perforations as frequent; and the *Laminæ Spongioſæ* without, both few and thin ſet; by which that Creature has but an ordinary Senſation of Smelling, and only ſuch as is convenient for the Choice of it's Food; becauſe the *Nervus Olfactorius* has not ſuch a Space wherein to be diſpers'd as the *Septum* and Cartilaginous Sides of the *Proboſcis*; which is ſo great, that ſcarce can a Particle of any odoriferous Subſtance eſcape the touching of ſome one or other of the nervous Filaments: Whereas in Horſes, there being but a ſhort Space betwixt the *Os Cribroſum* and the Noſe, the additional Surfaces of the *Laminæ Spongioſæ*, and the Tenſion of the Bone of the Noſe on both Sides, otherwiſe than in the *Elephant*, who has no Bone there at all, are very convenient to ſupply that Defect; for the more extended a Nerve is, the greater is it's Senſation, and a Bone is fitter for Tenſion than either a Cartilage or other ſoft Subſtances are. The *anterior Foſſa (b. b.)* is from the Right to the Left 8 Inches, and from before to the *Nervus Opticus* behind 4 ½ Inches, and of Depth, *i. e* ſtraight down from the *Sella Turcica*, or in the Middle betwixt the foreſaid Holes to the Bottom of the *Os Ethmoides* on each Side 2 Inches. The two middle *Foſſæ* are bounded before by the two *anterior* Eminences (*e. e.*), and behind by the two *Proceſſus Petroſi* (*s. s.*). The Seat of the Brain is here 12 Inches D meter *(r. r.)*. In the Center between the two *anterior Proceſſes* is t *firſt* Pair of Holes *(f. f.)* at an Inch Diſtance. Theſe run obliquel etween two ſmall Eminences, where the *Glandula Pituitaria* was l g'd, call'd the *Sella Turcica (u.)*; and theſe two *Proceſſes* are call'd i human Subjects *Clinoides*. This Pair of Nerves runs obliquely downw rd 6 Inches, and paſſes out below the *Lamina* on each Side of the H ad *(s.)* which frames the upper Edge of the *Sinus* for the Globe of e Eye, being the ſecond Pair, call'd the *Optick Nerves*. Theſe two *Proceſſes*

Anterior Foſſa *of the Skull.*

Fig. 85.

Middle Foſſæ.

Firſt. Pair of Holes.

Fig. 63.

Second Pair. *Proceſſes* running ½ Inch back on each Side, at the ſame Diſtance afford
two more Holes paſſing in below them, which could not be ſhewn
in the Figure; this is call'd the *Foramen Lacerum*, and thro' it paſs the
third Pair, or *Oculorum Motorii*; the *fourth* Pair, or *Pathetici*; the
Fig. 85. *Ophthalmick*, or *firſt* Branch of the *fifth* Pair, and all the *ſixth* Pair
Third Pair. (*g. g.*). The *third* Pair of Holes is at the Back of the two *anterior* Eminences,
betwixt the firſt Pair and the external Part of the Seat of the Brain
4 Inches diſtant from each other (*h. h.*). They are the largeſt of all
thoſe in the Bottom of the Skull, except that for the Spinal Marrow,
Vid. ſupra. and have a peculiar Uſe, which I mentioned before, *viz.* that they
are for the Tranſmiſſion of the *ſuperior* Branch of the *ſecond* Diviſion
of the *fifth* Pair of Nerves, and a Branch of an Artery which proceeds
from the *Arteria duræ Matris* (*k. k.*); being ſeparated from it by
the bony *Septum* which paſſes betwixt it and the Hole for the *third*
Branch of the *fifth* Pair (*i. i.*), runs along the *Crena* (*x. x.*), and paſſes
Fourth Pair. out with the foreſaid *ſecond* Branch (*g. g.*). The *fourth* Pair of Holes
then is for the Egreſs of the *third* Branch of the *fifth* Pair (*i. i.*) and
Fifth Pair. Ingreſs of a Branch from the *Arteria duræ Matris*; and the *fifth* pair is
Sixth Pair. for the *Arteria duræ Matris* itſelf (*k. k.*). The *ſixth* Pair is for the Carotid
Artery (*l. l.*), which is otherwiſe ſituated here than in Human
Subjects; for in them it is betwixt the *Proceſſus Petroſus*, and two *poſterior*
Proceſſus Clinoides; whereas here 'tis betwixt the *Proceſſus Petroſus*
and Center of the Baſe of the Skull, to each Side about 3 Inches
Seventh Pair. diſtant from each other. The *ſeventh* Pair is for the *Nervus Auditorius*
(*m. m.*), being ſituated in the *Proceſſus Petroſus* (*S. S.*). And here
'tis obſervable, that from the Side of the Hole where the Carotid Artery
(*l. l.*) paſſes toward the *Os Petroſum*, there is an Hole which runs
about 1½ Inch outward, forms an Angle, and then paſſing by the Sides
of the *Cavitas Tympani* (*e.*) runs ſtraight downward and penetrates the
Skull (*l.*). This I take to be the Hole for the hard Portion of the *Nervus*
Auditorius, which does not here, as in other Animals, paſs in at
the Hole of the *Proceſſus Petroſus* with the ſoft Portion; but as it
proceeds from the Brain, goes along the Sides of the Carotid Artery to
this Hole. This hard Portion, as I ſaid before, was much bigger as
we traced it running forward above the Temporal Muſcle, and going
Eighth Pair. to the upper Lip to be afterward diſpers'd in the *Proboſcis*. The *eighth*
Pair is for the internal Jugular Vein, and *Par Vagum*, which paſſes
A Hole *for the Spinal Marrow.* out at the ſame Hole (*n. n.*). And the *ninth Impar*, is for the Spinal
Marrow; of which already. And thus we have given an Account of
all the Parts of the inner Surface of the Skull.

Of the Ear, n. 358. *p.* 885. In order to give a better Account of the *Ear*, I have now broke
up the *Os Petroſum* of the Right Ear: But I firſt obſerve that the *Auris*
Externus of this big Creature lies flat, and not protuberant as in
other Quadrupeds, whoſe Cartilaginous Subſtance is capable of divers
Motions perform'd by ſeveral Muſcles, whereby the inner Ear is
preſerv'd from the great Violence of the external Air, which upon
ſome

ſome Occaſions might, perhaps, injure or break the thin and delicate Membrane of the *Tympanum.* It is alſo for this Reaſon that the *Meatus* is further guarded, by the Contortions and oblique Poſition of the Cartilage at the Orifice of the *Meatus*, which only admits of a determinate Quantity of Air, ſufficient for the Vibration of the *Membrana Tympani*, by which a diſtinct Sound is conveyed to the *Senſorium commune*; whereas did the Air admitted exceed it's due Proportion, nothing but the confuſed Idea of a Sound would follow, ſuch as reſembles the ruſhing of Water, *&c.* or that Noiſe often obſerved, when, by a ſupervenient Cold, or the like, Obſtructions are generated within the Ear itſelf. And in Man, becauſe the *Auris Externus* is alſo flat, not only are theſe Turnings and Windings obſervable in the Cartilage at the Entry, but the *Meatus* itſelf is likewiſe obliquely ſituated, to prevent the aforeſaid Inconveniencies. But there is no Need for ſuch a Contrivance in the *Elephant*, whoſe external Orifice of the *Meatus* is patulent, open (ſcarce being guarded by the Cartilage) and ſtraight, whoſe Length (it reaching from the external to the internal Table of the Skull) is ſufficient to prevent the Acceſſion of too great a Quantity of Air to the *Tympanum*; for in it's Progreſs moſt of the *Columnæ Aëris* beat againſt one or other of the Sides of the *Meatus*, inſomuch that their Force is inhibited, and only ſo many as ſuffice to convey the Sound, can reach the *Tympanum* itſelf.

Meatus Auditorius.

The *Meatus Auditorius* then is a long ſtraight Tube or *Canule* ſituated horizontally, and reaching from the outer to the inner Table of the Skull, in Figure not unlike the Barrel of a Piſtol, but ſomewhat oval, the Sides of whoſe Cavities are hard and ſolid, about the Thickneſs of a Half-penny, from whoſe outer Part ſeveral of the *Laminæ* betwixt the 2 Tables of the Skull do ariſe (*Fig.* 71.). It's Cavity is an Inch, or ¼ of an Inch Diameter, and Length 9 ½ Inches; being ſomewhat enlarged as it arrives at the *Crena* for the *Membrani Tympani.* (*Fig.* 72.)

Fig. 71.

Fig. 72.

Crena *and* Cavitas Tympani.

This *Crena* is 2 Inches in Circumference, within which is the *Cavitas Tympani*, conſiſting of two different Surfaces; the one much deeper and cellulous, the other more ſuperficial and ſmooth. The firſt runs perpendicularly down ½ Inch from the *Crena Tympani.* It's Bottom is variouſly divided into ſeveral *Cellules*, not unlike a Honey-Comb, but irregularly diſpoſed. It's bony *Laminæ*, by which theſe Cellules are diſtinguiſhed from each other, are thicker at the Top than at the Bottom, they being 1 Line, 2 Lines, or 1 ½ Line diſtant from each other, and about ¼ Inch deep. Could I have got it ſo well cleanſed as I wiſhed for, doubtleſs I might have obſerved their Communication with each other, by means of certain Orifices which ſerve to convey what ſuperfluous Moiſture is contained in them; for we may reaſonably ſuppoſe, as in all other Cavities of the Body, there are certain Glands for ſeparating proper Liquors convenient for the Uſes deſigned; ſo here there ſeems to be a Neceſſity for ſeparating a certain Quantity of Moiſture, fit to lubrify the Muſcles of the Oſſicles, and facilitate their Motion;

as alſo to preſerve the *Membrana Tympani* from becoming too dry. This Dryneſs of the *Membrana Tympani*, and the Thickneſs of the Liquor ſeparated by theſe Glands, is often the Cauſe of a Deafneſs in Human Subjects; eſpecially thoſe that are advanced in Age. This cellulous Structure of the *Cavitas Tympani*, ſeems to be very proper for receiving of the ſuperfluous Humidity; and theſe Communications are requiſite for conveying it from one Cellule to another, till it is emptied into the *Receptaculum Commune*, the *Aqueduct*, whereof hereafter.

Fig. 72.

This firſt or cellulous Cavity is two Inches broad, and reaches from the *Crena Tympani* to the *Foramen Ovale*, or Entry into the *Veſtibulum*, which is ſhut by the *Stapes*. The ſecond Part of this Cavity is more ſuperficial (*Fig.* 72. *e.*), in Form not unlike a Pear from a narrow Beginning becoming broader and more ſuperficial, terminating ſemicircularly, ſmooth in the Bottom, and having ſeveral incurvated Lines running acroſs it; it reaches much farther than the *Veſtibulum*, being one Inch five Lines from before to behind, and one Inch tranſverſly where broadeſt. What ſuperfluous Moiſture it contains is diſcharged into the fore-named *Aqueduct*.

Beſide the above-mentioned Uſes for theſe two Cavities, *viz.* to receive and diſcharge the ſuperfluous Moiſture, they are alſo moſt beneficial and aſſiſting to the Hearing: For, no ſooner is the external Air modulated, and the *Membrana Tympani* moved thereby, than the Sound is conveyed by the *Oſſicles* to the *Nervus Auditorius*, and the Undulation continued, firſt by the *Anfractuoſities* of the firſt Cavity, and then by the *Gyres* and incurvated Lines of the ſecond; ſo that we may eaſily account for the acute Senſation of Hearing, wherewith *Elephants* are ſaid to be endowed: For as the tame ones are moſt exact in obeying their Maſters Commands; ſo the wild ones are ſoon aware of what Traps or Snares are laid to catch them, by the tremulous Motion conveyed to their Ear from the cavous Parts of the Earth, where the Pit into which it is expected they ſhould fall, is digged. It is eaſy therefore to explain whence the Acuteneſs of the Senſation of this Animal may proceed; for as the *Nervus Olfactorius* has a large Space and Bounds wherein to be diſperſed, *viz.* the two Cavities of the *Proboſcis*, which are both long and large, ſo that ſcarce any *Columna Aëris* can enter them, but ſome one or other of the Filaments of the *Nervus Olfactorius* diſperſed in theſe Cavities muſt be touched, whereby the Idea of Smelling muſt be conveyed to the *Senſorium commune* in a more intenſe Degree, and the Animal ſoon become ſenſible of whatever approaches that is noxious or nauſeous to it, and thereby is taught how to avoid it; ſo this Structure, for a quick Conveyance and long Continuance of the Sound, is a great Means both to make the *Elephant* ſoon receive the Sound, and have a deep Impreſſion of it.

The Aqueduct.

The *Aqueduct* is a flat Tube or Pipe, whoſe Orifice is ſo ſituated betwixt the two fore-mentioned Cavities, that if there be any ſuperfluous Humidity contained in them, it muſt need be diſcharged (at leaſt in this Animal) into the Mouth; for as it is ſituated where the firſt Cavity terminates, ſo the ſecond, from a broader and more ſuperficial Beginning, muſt needs diſcharge it's Moiſture, by it's more narrow and deeper Termination, into this Receptacle; alſo it deſcends directly towards the Mouth, paſſing through the Skull below the Hole for the Jugular Vein (*m. m.*) betwixt the Hole for the *Carotid* Artery (*p. p*), Fig. 64. and that for the *Arteria duræ Matris* (*q. q.*), whence deſcending (*n. n.*) it is joined with it's fleſhy Part, which diſcharges itſelf into the Mouth on each Side, behind the back Part of the inner Teeth of the upper Jaw. This Situation of the Aqueduct makes it plainly appear, that it's Uſe is to receive the ſuperfluous Moiſture from the *Cavitas Tympani*; for beſides the Glands above-mentioned, fit for ſeparating ſuch a Quantity of Humidity as may lubrify the Muſcles, and facilitate both their Motion, and that of the *Oſſicles*; the very Vapours that ariſe in ſuch a Cavity as that of the *Tympanum* in this Animal, muſt at laſt be converted into a Liquor, and that muſt either again be received into the Blood Veſſels, or otherwiſe diſcharged by ſuch a Receptacle as this. Further, if there be a Neceſſity for Glands in the *Meatus Auditorius* without the *Tympanum*, to ſeparate a certain Liquor, by which the acrimonious Particles of the Air are obtunded and hindred from being offenſive to the Nervous Membrane of the *Tympanum*, (which muſt be of a moſt acute Senſation) and for moiſtening it, by which it the more eaſily receives the Vibration of the Air; ſo ſuch Glands as theſe ſeem to be requiſite in the *Cavitas Tympani* for the Uſes above-named. And ſince what ſuperabounds of this Moiſture, cannot be diſcharged outwardly, as that of the *Meatus*, this Aqueduct ſeems to be moſt convenient for that Purpoſe. Some are of Opinion that this Aqueduct is alſo aſſiſting to the Hearing, eſpecially in Men; becauſe it is generally obſerved that they who are deaf, open their Mouths wide, when they are deſirous to hear more diſtinctly; but I ſee not how that can be; for tho' the Cavity of the bony Part of the Aqueduct, in moſt of Animals, is proportionally large enough, yet it's carnous or fleſhy Part lies for the moſt Part ſo flat, and it's two Sides are ſo collapſed together, that ſcarce any Air can be admitted, at leaſt ſo far as to be ſubſervient to the Hearing.

The four Bones of the Ear.

The *Oſſicles* in this, as in other Animals, are three, or rather four in Number; for though I did not procure the *Os quadrangulare* of *Du Verney*, yet I have good Reaſon to believe it was there; becauſe there is a conſpicuous *Sinus* in the Extremity both of the *Incus* and *Stapes*, where they are articulated, ſo big as to contain the Head of an ordinary Pin; and when I conſider the Angle which muſt have been formed by the Articulation of theſe two Bones, I look upon this ſmall Bone to ſerve for the ſame Purpoſe as the *Patella* in the Knee, and *Seſamoide* Bones in the Fingers and Toes.

The Malleolus.

The *Malleolus* is an irregular Bone, and doubtleſs has been endowed with pretty large Muſcles, becauſe of the Rugoſities, Protuberances, and *Sinus*'s obſervable in it. It has a protuberant Head (*Fig.* 74.)

(1), four Lines broad, next to that a *Crena* or ſemircular *Sinus* (2), after which the Bone is raiſed, affording a protuberant Margin to an oblong *Sinus* (3), for receiving the Head of the *Incus*, four Lines broad. The oppoſite Part of this *Sinus*, or back Part of the Bone, is convex, of an unequal rugous Surface, with a great many Protuberances and Depreſſions, for the Origins and Inſertions of the Muſcles, for the Space of five Lines; where it forms an Angle, from whence it becomes flat and ſmooth, being three Lines broad, and reaching four Lines to another Angle (5), where the *Manubrium Malleoli* begins, and where it becomes more round; from whence it gradually tapers to the Point, being ſix Lines in Length.

Fig. 75. The Head of the *Incus* is four Lines broad (*Fig.* 75) (1), below which is the Neck or an oblique *Sinus* (2); next to that are two *Apophyſes* (3. 3.), one on each Side: Theſe deſcending obliquely outwards, and becoming flat, meet in a Point (*Fig.* 77.) (5), whence aſcending obliquely inward, this Production is joined to another ſmall round one, like the *Manubrium Malleoli* 4 ½ Lines long (6). This has the forementioned ſmall Excavation or half-round *Sinus* (7), which with the Extremity of the *Stapes*, I ſuppoſe to have contained the *Os Quadrangulare*, or rather *Orbiculare*, according to the Figure of the *Sinus*.

The *Stapes* differs much in Figure from the human one. From it's
concave Extremity 'tis enlarged on each Side by two ſmall ſlender Pro-
ductions, not unlike the Proceſſes of the *Vertebræ* of ſome Fiſhes (*Fig.*
Fig. 76. 76) (2. 2.), to which is joined the *Baſis* (*Fig.* 77.), ſo thin almoſt as the
Fig. 77. Scale of a Fiſh: This was accidentally ſeparated from it's two Sides,
and remained in the *Foramen Ovale*, from whence I pulled it with a Pin:
'Tis Concave toward the *Stapes*, and convex toward the *Veſtibulum*.

The *Foramen Ovale* lies ſo hid and obliquely in the Side of the *Cavitas Tympani*, that it could not be delineated in it's true Dimenſions. Near to it is another Hole, oblong and ſharp at both Ends, both which give an Entry into the *Veſtibulum*.

Fig. 82. The *Veſtibulum* is of an irregular Figure (*Fig.* 82.) (*a*); 'tis for the
moſt part three Lines from the one Side to the other, and perforated
by eight Orifices, *viz.* five for the Canals of the *Labyrinth* (*Fig.* 81, 82.)
Fig. 81, 82. (*a*), one for the *Cochlea* (*Fig.* 82.) (*b*), and two for the *Feneſtræ* (*b. c.*).

The *Cochlea* is a long Cavity, conſiſting of three *Gyres* or *Meanders*
Fig. 84. (*Fig.* 84.) (*d, e, f.*) It's Orifice, where it proceeds from the *Veſtibulum*, is
but ſmall: but it afterwards widens, ſo that the firſt Courſe of this Cavity is a third Part larger than the ſecond (*e*), and proportionally the third is leſs than the other two (*f*), 'till it terminates in an Orifice (*g*) ſituated in the Top, for receiving a Branch of the ſoft Portion of the *Nervus Auditorius*, which accompanies and paſſes along all it's *Gyres*.

The Hardneſs and Solidity of the Bone (for which it may juſtly be called *Os Petroſum* in this Subject) was ſuch, that I could not ſo exactly trace the three Canals or Ducts of the *Labyrinth*, ſo as to give a true Idea of the Manner of their ſeveral Turnings. But *Valſalva*'s Figures of the

Human Ear directed me ſo exactly, that I eaſily found out the ſeveral Orifices, and opened them ſo far as to find out the Situation and true Dimenſions, by introducing a Hog's Briſtle, then cutting it off, and ſtretching it out to the Scale. Thus, after laying open the two *Foramina* which gave an Inlet to the *Veſtibulum*, I ſoon perceived the ſeveral Orifices, which, in ſo large a Subject, were pretty conſpicuous. I firſt turned to the one Hand, and diſcovered the *Duct* of the *Colchea*; this I purſued all along the Protuberance (*Fig.* 73.) (*d*), in doing of which, I laid wholly open the *Leſſer Duct* of the *Labyrinth (Fig.* 81, 82.) *(d)*: Then turning up the other Side of the Bone, I traced the ſoft Portion of the *Nervus Auditorius* divided into two Branches, one whereof was diſtributed into the *Colchea*, and the other to the *Labyrinth*. In filing the Bone a little farther, I opened a ſmall Part of the *Middle Duct*, and in a ſhort Time I diſcovered the *Ductus Major*; after which I meaſured their ſeveral Lengths, as is ſaid. Fig. 81, 82.

The *Labyrinth* then conſiſts of three *Lineæ Semilunares* or incurvated *Ducts*, whereof the *Major* lies in that Part of the *Proceſſus Petroſus* which regards the Seat of the Brain (*b*); this is twenty Lines, or one Inch eight Lines long. The *Medius Ductus*, one Part whereof regards the Orifice of the *Cochlea*, and the other is common with the *Major* for the Space of three Lines (*e*); this is fifteen Lines, or one Inch three Lines long: And the *Minor*, which regards the *Cavitas Tympani*, has one Orifice, which is near to the *Medius*, where it approaches the *Cochlea*, and the other near to the Orifice of the *Major*; this is one Inch long. *The* Labyrinth. Fig. 82.

The *ſeventh* Pair of Nerves, called in general the *Nervus Auditorius*, enters the *Proceſſus Petroſus*, and is divided into the hard and ſoft Portions, as in other Animals. In this Subject I find one Canule entring the Bone from the Sides of the Orifice for the *Carotid* Artery, about three Lines Diameter (*e*) (*b*), from thence running forward for the Space of one Inch four Lines; then bending downwards one Inch, 'till it meets with the Orifice at the Sides of the *Meatus Auditorius*, by which it pierces the Skull, and paſſes outward. This Canule, after it is entred the *Proceſſus Petroſus* for the Space of eight Lines, communicates with the Orifice, which uſually enters the foreſaid Proceſs from the Baſe of the Skull: And both theſe Orifices, after they have accompanied one another about five Lines, are ſeparated, and the ſoft Portion penetrates the Bone at two Places, as is ſaid. Fig. 74, 75.

I have now endeavoured to give ſuch a Deſcription of the *oſſeous* or bony Part of the Ear of this ſtupendous Animal, as I am in hopes may be uſeful for the clearing up of ſome *Phænomena* in leſſer Subjects: At leaſt we may hereby obſerve, what a Variety of Mechaniſm the great Author of Nature has thought fit to employ, in the ſeveral Parts of different *Species* of Animals. Thus both the external Ear of *Man* and of the *Elephant* lie flat, as being moſt convenient; for if they had been protuberant as in moſt Quadrupeds, how unſuitable would it have been in Man, who is the moſt perfect of all Creatures, not upon the Account of his Reaſon alone, but alſo as he is a Pattern for Beauty and the Symmetry of his Parts? and how unſeemly would it have been in the *Elephant*, if his external Ear had ſtuck out, and been proportional to his other Parts; conſidering what an extraordinary Aſpect he makes already by his Trunk and Tuſks? but the Ears in theſe two Subjects differ by the Tortuoſity of the Cartilage, and oblique *Meatus*, to prevent the Injury of the Air, by it's immediate Acceſs into the inner Ear in Man; whereas in the *Elephant* the external Orifice is fully expoſed to the Air; but then the Length of the *Meatus* hinders any more Air than is convenient from arriving at the *Tympanum*. We likewiſe ſee in the *Seal* and *Otter*, that thoſe two amphibious Quadrupeds have no external Ear further protuberant than the other Parts of their Head; for had it been otherwiſe, their ſwimming and diving would have been much hindred: But it's two Sides are ſo collapſed, that no Water can enter in when in the deep, though it can receive ſufficient Air when aſhoar. The *cellulous* Cavity of the *Tympanum* in the *Elephant*, may well be compared to the *Apophyſis Maſtoides* in Man; and the ſecond Cavity of a plain Surface ſeems to be analogous to the cavous *Maſtoides* in *Sheep*, *Cats*, *Dogs*, &c. So that we ſee that whereas other Animals have but one Cavity for aſſiſting the Vibration of the Air, and Continuation of the Sound in the *Tympanum*, this Animal has two, or a large one with two different Surfaces. The *Aqueduct* both by it's Figure and Poſition in this Animal does plainly ſhew us the Uſe of it in other Animals, which is to receive the ſuperfluous Humours in the n.327.p.126. *Tympanum*, and convey them to be diſcharged in the Mouth.

From the Head we go to the *Trunk*, which conſiſts of the Spine, Ribs, and *Sternum*. The *Spine* is divided into the *Vertebræ* of the Neck, Back, Loins, *Os Sacrum*, and *Tail*. The *Vertebræ* of the Neck differing from each other in ſeveral Things material, I ſhall ſpeak of them ſeparately: Whereof,

The firſt Vertebra *of the* Neck. Fig. 93. The firſt called *Atlas*, has four conſiderable Cavities; two at the fore-part (*b. b.*), whereby it receives the *Condyles* of the Skull, and two at the back-part (*c. c.*), whereby it receives the Baſe of the following *Vertebra*; the firſt two are 2 ½ Inches from above to below, and 2 Inches from the right to the left. It has a large Hole in the middle, divided into it's larger Part (*a.*), 3 Inches Diameter, which is for receiving the Spinal Marrow, and leſſer, which receives the Tooth of the following Fig. 93. (*b.*). Four Perforations, or two Pair of Holes at the Sides; one at it's lower and fore-part (*c.c.*), which receives the *Arteria Cervicalis*, or, *Vertebralis* from the Side of the Spinal Marrow, and conveys it to a *Crena* (*e. e.*) along which it runs, till it again penetrates the ſame Bone (*d. d.*), and goes out at the back-part; after which in it's Progreſs it perforates all the tranſverſe Proceſſes of the reſt of the *Vertebræ* of the Neck, as is uſual in other Animals. This *Crena* is guarded on it's Outſide, or at the Extremity of the tranſverſe Proceſſes by a Protuberance, ſtance, which runs toward the Skull ½ Inch (*a. a.*) till it be equal to the Sides of the Hole for the Spinal Marrow. At it's upper and fore-part it inclines obliquely (*f.*) where 'tis 3 Inches thick, and at it's lower and back-part (*e.*) it has a Protuberance which is extended where it embraces Fig. 94. the Tooth. This *Vertebra* is in Diameter 12 Inches (*a. a.*) The tranſverſe Proceſſes are in Breadth from above to below 2 Inches, and in Length at their lower Part 3 Inches.

The ſecond.

The ſecond *Vertebra* has remarkable in it, 1ſt, a large Protuberance called the Tooth (*d.*), which is received by an Hole in the former, Fig. 96. and ſerves as an Axis upon which the Head is turned round. This Tooth runs forward from the Body of the *Vertebra* 2 Inches above, and 2 ½ Inches below, tapering and terminating in an obtuſe Point. 2. A large Protuberance ariſing from it's upper and middle Part (*a. a.*) like the *Proceſſus Spinoſus* in others, 4 Inches from the Beginning of the tranſverſe Proceſſes, two Inches broad at the Top, terminating in two obtuſe Points, with a *Sinus* (*b.*) (larger at the back than the fore-part) in the middle. This Protuberance inclines forward toward the firſt *Vertebra*. 3. It's Body or back-part, and Baſe of the Tooth (*f.*) tranſverſly 4 ½ Inches, perpendicularly 4 Inches. 4. Two oblique Proceſſes, Fig. 97. by which 'tis articulated with thoſe of the following, and betwixt which there are four Inches (*b. b.*) 5. Two tranſverſe Proceſſes (*g. g.*) each 2 Inches long. At it's fore-part on each Side of the Tooth (*d.*) are two Protuberances (*e. e.*), which are received by the two hind Cavities Fig. 96. of the firſt *Vertebra*. This *Vertebra* is two Inches thick from before to behind, the Hole for the Spinal Marrow 2 Inches Diameter, thoſe for the Cervical Artery (*f. f.*) ½ Inch Diameter. Between the oblique and Extremity of the tranſverſe Proceſſes 'tis 6 Inches.

The third and fourth Vertebræ.

The third and fourth *Vertebræ* differ from this, 1ſt. In their four oblique Proceſſes (*e. e.*) *viz.* two by which they are articulated with the preceding, and two with the following, which is common to thoſe of the Neck, Back and Loins. 2. In their convex Body before Fig. 98, 100. (*b. b.*) and concave behind (*c. c.*), where they are received by, and do receive the preceding and following, which is alſo common to the other *Vertebræ*. 3. In their Eminencies at the Top (betwixt the oblique Proceſſes) at 4 ½ Inches diſtance (*e. e.*), betwixt which there is a Depreſſion in the third, and a ſmall Protuberance in the Midſt of this Depreſſion in the fourth. That tranſverſe Proceſſes (*f. f.*) are 2 Inches broad at the Extremity, from which they deſcend obliquely 3 Inches, having a Protuberance on each Side, betwixt which and the Body of the preceding *Vertebra* (*b. b.*) does proceed a Branch of the Fig. 109. Cervical Artery, which it continues to do from betwixt all the other *Vertebræ* of the Neck, till it comes to betwixt the ſeventh of the Neck and firſt of the Back, where 'tis wholly ſpent. Betwixt the oblique Proceſſes (*e. e.*) and tranſverſe (*f. f.*) it is 4 Inches. The Hole for the Cervical Artery (*d. d.*) is here oval. The Bodies of theſe *Vertebræ*, are thinner below than the former: They are four Inches in

Diameter, being of the ſame Dimenſions with all the other *Vertebræ* of the *Spine*, 'till you come to the *Os Sacrum*. Thoſe in the Neck are more flat before, and thoſe in the Back more protuberant. Beſides thoſe *Sinus's* in the Inſide of the forementioned Protuberances in the Neck, there is likewiſe a *Sinus* betwixt the tranverſe Proceſſes of each *Vertebra* and it's Body, throughout the whole *Spine*, for Tranſmiſſion of the ſeveral Conjugations of Nerves from the Spinal Marrow.

The fifth. Fig. 102. The fifth *Vertebra* is of the ſame Dimenſions with the other two, and differs in nothing from them but it's Spinal Proceſs, which from ½ an Inch in the former, ariſes to 1 ½ in this, being ½ an Inch broad, and thin at the Extremity.

The ſixth. Fig. 104. Fig. 109. The ſixth *Vertebra* differs from all the reſt in it's tranverſe Proceſs, which is as far forward as the reſt, and ſends out another Proceſs, which runs as backward; ſo that from the Extremity at the fore-part to that at the back-part, 'tis 3 Inches. It alſo ſends another Protuberance obliquely outward 1 ½ Inch (*i. i.*). At this Proceſs the Cervical Artery paſſes out from the tranſverſe Proceſs of the *Vertebra*, and only ſends a Twig to the

The ſeventh. Fig. 106, 107. Seventh *Vertebra*, or laſt of the Neck, which differs from all the reſt; *1ſt*, In the Length of it's Spinal Proceſs, which is augmented from 3 Inches in the former to 5 in this (*g. g.*). 2. In the Smallneſs of the Hole for the Cervical Artery (*d. d.*), this being the laſt perforated tranſverſe Proceſs, as is ſaid. 3. In a *Sinus* on each Side of it's Body behind (*i. i.*), whereinto it receives Part of the firſt Rib.

The Thorax. The *Thorax* is divided into the *Vertebræ*, Ribs, and *Sternum*: There are 19 *Vertebræ*, correſpondent to ſo many Pair of Ribs; they differ nothing from the former, except that their Body is more protuberant, that their Spinal Proceſſes are augmented and diminiſhed in their Length, according to their Situation, and that they have a *Sinus* in each Side, both before and behind, for Reception of their reſpective Ribs. For the Weight and Dimenſions of their Spinal Proceſſes, ſee the Table.

Ribs. The Ribs are divided into the true (which are articulated with the *Sternum*) and falſe ones, with and without Cartilages. There are 8 Pair of true Ribs, 8 Pair falſe with, and three without Cartilages. The Cartilages here are ſoft, as in Human Subjects, and not bony, as in Oxen, Harts, *&c.* The Length of both the Ribs from the one Extremity to the other, and along their inner Surface, that you may the better know how much they are bended, with their Breadth at the Extremity and Weight of each Pair, ſhall be given.

Sternum. The *Sternum* conſiſts of four Bones; they are placed edgewiſe, being two Inches thick above, and ſharp below: From the Fore-part to the Point of the *Cartilago Enſiformis* 'tis 25 Inches; whereof the firſt is 88 Inches long, and 4 ½ Inches broad at the Articulation of the firſt Rib; the ſecond 4 ½ Inches long, and 3 Inches broad; the fourth 4 Inches long, and 2 ½ Inches broad; the reſt of the Length is made out by the *Cartilago Enſiformis*.

The Vertebræ *of the* Loins.

The *Loins* conſiſts of three *Vertebræ*, whoſe Spinal Proceſſes are but ſhort; their tranſverſe Proceſſes a little longer than thoſe in the Back; which beſide their Weight, (for which ſee the Table) is all that is material about them.

Os Sacrum Fig. 110.

The *Os Sacrum* conſiſts of five Bones; they are of a flat Surface before (B) each having three Proceſſes (*viz.* two oblique, and one ſpinal, under which the ſpinal Marrow deſcends) behind. They are perforated before by 4 Pair of Holes, placed at their Interſtices on each Side. It is 12 Inches long, and 7 ½ broad, where 'tis articulated with the *Oſſa Innominata* above, and 6 Inches broad at the lower Part See *Fig.* 110. and 111.

The Vertebræ *of the Tail.*

The *Tail* conſiſts of twenty-nine *Vertebræ*, whoſe Differences are to be ſeen in the Tables. From the *Os Sacrum* to the Eighth they have five Proceſſes, *viz.* two tranſverſe, two oblique, and one ſpinal, under which the ſpinal Marrow deſcends, ſending forth a Conjugation of Nerves from betwixt each of them. From the eighth to the ſixteenth, each has 4 Proceſſes, *viz.* two longitudinal behind, betwixt which the Remainder of the ſpinal Marrow ſtill deſcends, and two tranſverſe: The reſt have no Proceſs at all, but are of a Kind of quadrangular Figure, having a Ridge which deſcends before and behind, and on each Side; being ſomewhat bigger at each End, and ſmaller at the Middle. All the *Vertebræ*, as well in the Neck and Back, as Tail, had Cartilages, which run betwixt each of them; they were about ½ Inch thick in the Back, thinner in the Neck, and thicker proportionably in the Tail. Theſe Cartilages I was obliged to ſupply with Leather in mounting the Skeleton.

The Fore *Extremities.*

The Scapula. Fig. 108.

Since this is a Quadruped, we ſhall divide the Extremites into the Fore and Hind ones. We begin the fore Extremities at the *Scapula*, which is uſually divided into it's Head, Neck, *Spine*, Proceſſes, fore and hind Cavities, (*i. e.* theſe Parts before and behind the *Spine*) it's concave Part, which lies upon the Ribs, and it's convex or outer Part, and it's Margin. The Head *(a)* which receives the *Os Humeri*, is oblong, (becauſe the Motion of the *Humerus* perform'd by this Animal, is rather Flexion and Extenſion, than Adduction or Abduction;) wherefore the Cavity being 5 ½ Inches long, is only 3 ½ Inches broad, and the Margin of the Bone ariſing from the Fore and Back-part *(b. b.)* makes it two Inches deep; for at the Sides, the Margin is equal to the Cavity. the Back-part there are two Proceſſes; that which regards it's convex rt is 2 Inches long, rugous, thick and obtuſe; that which regards e concave, runs two Inches backward, where it forms an obtuſe ngle; whence it aſcends 3 Inches to the Neck: This has a ſharper ge than the former, being ſomewhat incurvated. Betwixt theſe o Proceſſes is a rugous *Sinus* two Inches broad, aſcending from the vity of the Head 3 Inches to the Neck, and riſing ſomewhat in the

Middle of it's Progreſs. The Neck (*c. c.*) is flat, being more obtuſe at it's Back-part, and where is the laſt nam'd Protuberance, and ſharper at it's fore, where is a little Protuberance toward the *Spinæ* on the convex Side, being more plain on the concave. Betwixt the firſt of the fore-nam'd Protuberances (*b.*) and the *Spina*, there is a *Sinus* which aſcends 4 Inches (*d.*), and from the ſame Protuberance (*b.*) to the Extremity of the *Proceſſus Coracoides* (*e.*) is 3 ½ Inches. This *Proceſſus Coracoides* is that Part of the *Spina* (*e.*) which runs toward the Neck of the *Scapula*, but does not, as in Men, defend the *Humerus* from Diſlocation. 'Tis very rugous and convex before, but concave at it's Back-part, being 3 ½ Inches broad at the Point, it aſcends 11 Inches, where 'tis raiſed 5 Inches from the Body of the *Scapula* (*f.*), it inclines a little backwards and aſcends 12 Inches more, till it be loſt where the *Epiphyſis* begins (*g.*) being ſtill concave at the fore, and convex at the Back-Part. From the *Spina* (*f.*) it ſends forward a Production 8 Inches long (*h.*), 3 Inches broad at it's upper Part, two Inches about the Middle where 'tis crooked, and 1 ½ Inch at it's lower Extremity where 'tis thin and ſharp; but at it's upper Part thicker and rugous, concave at the inner, and convex at the outer Side. This Proceſs ſerves to keep the *Muſculi ſupra-ſpinati* within their Bounds, when they pull up ſuch a vaſt Weight as the fore Leg. As the *Spina* runs up 5 Inches from this Production, 'tis rugous and thick in it's Edge, from thence it becomes gradually thinner till it comes to the *Epiphyſis*. The back and upper Part of the *Scapula* is very thin, and ſharp from the Neck (*c*) 16 Inches upward to (*m.*), from thence it aſcends 5 Inches to the Place where the *Spina* ends, and forms a very rugous and ſpongeous *Epiphyſis*, thick at the upper End (*l.*), thence it deſcends obliquely two Foot (*i.*), whence it's fore Edge runs obliquely in toward the Neck 10 Inches, being ſharp; thence it tends outwards and deſcends other 5 Inches till it comes to the Neck. All the upper Part of the *Scapula* from (*m*) to (*l.*) where 'tis thickeſt. and from (*l.*) to (*i.*) where 'tis thinner, except towards it's lower Part, is cover'd with an *Epiphyſis* (as is ſaid) ſpongeous and rugous, which ſeparated by the Boiling, is a further Argument that this Animal was young, according to their Term of Life; 'tis otherwiſe a very thin Bone and ſolid, except where the *Epiphyſes* are.

The Humerus. The *Humerus* is a very irregular Bone; it's Head is in Circumference 2 Foot, having two remarkable *Epiphyſes*, one whereby is articulated with the *Scapula* from before to behind, with a convex Surface 8 Inches, and from the Right to the Left 4 ½ Inches, and another on the Outſide riſing higher and ſharp about 1 ½ Inch. Round this *Epiphyſis* is 11 Inches, and from before to behind with a flat Outſide 6 ½ Inches. Betwixt the *Epiphyſis*, which receives the *Scapula*, and this Protuberance is a *Sinus* about 3 ½ Inches broad, and about 1 ½ Inch deep; as it deſcends toward the Inſide it becomes deeper, and only 2 Inches broad: 'Tis for lodging the external Tendon of the *Biceps*, analogous to a *Crena* for the ſame Purpoſe in human Subjects. The Neck of the *Humerus* is in Circumference 19 Inches, flat behind for the Space of 4 Inches; then forming an Angle and running obliquely outward 3 Inches; then paſſing forward below the utmoſt Protuberance 5 Inches, thence croſſing the forenam'd *Sinus*, it runs back, firſt flat, then a little convex, 7 Inches. Below this outward Protuberance there is a Rugoſity for the Inſertion of the *Flexores Cubiti* 6 ½ Inches long, and 3 ½ Inches broad at the upper Part, and thence deſcending gradually, it terminates in a Point. At the lower Part of this Rugoſity, the Bone is 13 ½ Inches in Circumference, having 3 Faces; one at it's Back-part 5 Inches broad, ſomewhat depreſs'd from the Inſide, then a little protuberant, as it tends outward; a ſecond on the Outſide, and 4 Inches broad; and the third on the Inſide, 4 ½ Inches broad, flat alſo. Here begins another conſiderable Rugoſity, ſmall and oblique from the Back-part of the utmoſt Protuberance of the *Humerus*, and becoming very rugous at this Place, continuing 6 Inches obliquely downward, and 2 Inches broad about the Middle. At the lower Part of this Rugoſity the Bone is 18 Inches in Circumference, with it's three Faces otherwiſe diſpoſed; that which was before terminated in an obtuſe *Spina*, and where it was an obtuſe *Spina* behind, now becoming flat. On the Outſide begins a conſiderable *Sinus*, being the Continuation of the *Sinus* formerly mentioned betwixt the *Epiphyſis Humeri* and the outer Protuberance, whence in it's Deſcent the Bone became depreſs'd; and now the *Sinus* is conſpicuos (3), being fram'd by an obtuſe *Spina*, deſcending obliquely forward from the foreſaid Rugoſity on the one Side, and another obtuſe *Spina* deſcending obliquely outward on the other. This *Sinus* (3) is 4 Inches broad from before to behind; thence meaſuring backward the Bone is flat 3 ½ Inches; meaſuring from thence on the Inſide, the Bone having form'd an obtuſe Angle, is 5 ½ Inches flat alſo. The *Spina* on the Fore-ſide, after it has deſcended 5 ½ Inches, the Bone becomes flat; that on the Outſide terminating in a conſiderable Protuberance, 4 ½ Inches long, where the Bone has only two Faces, convex before, and concave behind, and 17 Inches round. Behind it's foreſaid outward Protuberanee is 7 Inches; it becomes 1 ½ Inch depreſs'd in the Middle, where the *Sinus* for receiving the *Cubitus* begins. From the foreſaid external Protuberance it deſcends in a ſtraight Line 8 Inches, and from it's oppoſite Part at the Inſide it deſcends obliquely backwards 5 Inches; and here the lower *Epiphyſis* begins, where 'tis receiv'd by the *Cubitus* and *Radius*. This *Epiphyſis* is 1 Foot 10 ½ Inches round, being 3 Inches thick at the Outſide and flat, and 7 Inches at the Inſide and protuberant; betwixt which behind is a conſiderable *Sinus* 5 ½ Inches broad, and 2 ½ Inches deep, and before, another *Sinus* 7 Inches broad of the ſame Deepneſs. This *Epiphyſis* is at it's lower Extremity and Inſide, where it receives the *Cubitus* 5 ½ Inches from before to behind; of a convex Surface, and 6 Inches at it's Outſide, where 'tis receiv'd by the *Radius*. At it's Fore-part the *Sinus* is not very conſiderable, but at it's Back-part deeper and narrower for receiving the *Olecranon*. At the Extremity of the *Epiphyſis*, 'tis narrower, being only 6 Inches from the Right to the Left before, and 7 ½ Inches behind. And thus I have given an Account of the moſt irregular Bone of the Body, being at it's external Part 30 Inches in Length, and 26 at it's Internal; having a large Head conſiſting of an *Epiphyſis* receiv'd by a *Scapula*, a large Protuberance on the Outſide defending it from Diſlocation, and a *Sinus* betwixt the two reaching a good way back, thence deſcending to it's Neck, whence the Bone becomes flat (2) to about the Middle, deſcending on the Outſide, flat alſo, with two Rugoſities for the Inſertion of the Tendons. Betwixt this Outſide and Back-part, is a very large *Sinus* for the *Biceps*, which oblique Situation (3) is an admirable Contrivance for adding Strength and conciliating Length to this Muſcle. Now the Shape of the Bone begins to be chang'd, for whereas it formerly reach'd from before to behind, now it reaches from the Right to the Left, and it's lower Extremity (4) becomes broader, whereas at it's upper Extremity it was rounder.

The Cubitus *and* Radius. Fig. 61. *The* Olecranon.

The *Cubitus* and *Radius* are two Bones of a Singular Figure, the one lying above the other: We ſhall begin with the *Cubitus*, which is in Length from the Top of the *Olecranon* to it's Articulation with the Bones of the *Carpus* (5) 28 Inches. The *Olecranon* (1) from the Right to the Left, with a Surface ſomewhat convex, is 9 ½ Inches; and from before, where it is articulated with the *Humerus*, to it's utmoſt Point behind, in a ſtraight Line 7 Inches. This *Olecranon* as it deſcends, becomes narrower by Degrees, till it forms a *Spine*, which runs obliquely forward 13 Inches, where 'tis contracted from the foreſaid 9 ½ Inches to 3 in Breadth. Afterwards the Bone is enlarg'd on each Side, till it forms a convex Surface, which is received by, and articulated with, the *Humerus*. This Articulation is a *Ginglymus*, as in all other Animals, *viz.* the *Cubitus* and *Radius* together receive the *Humerus* on the Outſide before, which on the Inſide the *Cubitus* doth alone. Betwixt theſe two is a large Protuberance ariſing 2 ½ Inches, which is alſo received by the *Humerus*. Meaſuring from the Extremity of the *Cubitus* and *Radius*, which receive the *Humerus*, on the Outſide to it's oppoſite Part on the Inſide, including the Back-part of the *Olecranon*, it is 10 Inches. Both the Bones from the Right to the Left, at the Articulation before, are 7 Inches. Then meaſuring round the *Cubitus*, below the Articulation, is 16 ½ Inches. Here the Bone is flat before, from the Right to the Left 7 Inches; from thence obliquely backward to the foremention'd *Spine* beneath the *Olecranon* is 5 Inches on the Outſide, and 6 ½ on the Inſide. At the lower Part of the foreſaid *Spine* the *Cubitus* is in Circumference 11 Inches, *viz.* flat before 4 Inches, where it forms an Angle; thence running obliquely backward two Inches, forming another Angle; thence 1 ½ Inch obliquely backward, where 'tis a little protuberant; and from thence obliquely inward 3 ½ Inches. Round the lower Extremity of the *Cubitus*, and 3 Inches above the *Epiphyſis*, it is 12 Inches; *viz.* from the *Radius*, 2 ½ Inches; thence obliquely outward, with another flat Surface, 3 ½ Inches; and from thence, with a convex Surface, round the Back-part 6 Inches. The *Cubitus* at the *Epiphyſis*, from the *Radius* on the Fore-part to it's oppoſite Side on the Back-part, is 13 Inches; from the Upper-Part of the lower *Epiphyſis*, where 'tis articulated with the external Bone of the *Carpus*, obliquely inward, is 5 Inches. This ſame *Epiphyſis*, with convex Surface behind, from the Right to the Left is 5 Inches.

Radius.

The *Radius* in Length, from the external and upper Part of the *Cubitus*, on which it lies, and with which it is united, running obliquely inward, is 1 Foot 9 ½ Inches. At it's upper Part it ſends a Production outward 3 ½ Inches, by which, with a Part of the *Cubitus*, it receives the external Part of the lower *Epiphyſis* of the *Humerus*: From thence the Bone is contracted at it's Fore-part to 2 ½ Inches; then deſcending 10 ½ Inches, it becomes 2 ½ Inches broad; thence it enlarges gradually till you come to the lower *Epiphyſis*, where meaſuring from the Fore-part of the *Cubitus* to it's oppoſite and Back-part, the *Radius* is 8 ½ Inches; thence you deſcend 3 Inches, to it's Articulation with the internal Bone of the firſt Rank of the *Carpus*. This Bone is quadrangular above, deſcending to about the Middle, it becomes more convex; from thence it is gradually enlarged, and during the whole Progreſs pretty free from the *Cubitus*, except where 'tis conjoin'd with it at it's Upper-part: At the lower Articulation, the one is only ſeparated from the other by a Cartilage. The lower *Epiphyſis* of theſe Bones is of a very unequal Surface, and tho' not ſeparated from them by boiling, yet plainly diſtinguiſh'd by their Cartilages, which are not yet oſſified.

The Fore-Foot:
Carpus.

The Fore-Foot (as the Hand in human Subjects) conſiſts of the *Carpus*, *Metacarpus*, and Fingers, or rather Toes. The *Carpus* has 6 Bones diſpos'd into two Ranges, differing in Figure from each other, rugous before, endued with ſeveral Holes for Tranſmiſſion of Blood-Veſſels, and of a convex Surface behind, having ſeveral Inequalities for Inſertion of Tendons.

External Bone of the firſt Rank.
Fig. 114.

The external Bone of firſt Rank (1) is an irregular Bone, running forward with a convex Surface, till it meets with it's Copartner, 5 ½ Inches; paſſing in a more direct Line 3 ½ Inches behind. It has 3 Faces: It's upper View, in the Figure, whereby it is articulated with the *Cubitus*, from behind to before is 2 ½ Inches, from the Right to the Left 3 ½ Inches. At the Fore-part it has a Prominence which is receiv'd by the *Cubitus*, from which the Bone declines as it runs backward, and forms a Depreſſion about the Middle, riſing higher at the Hind-part. At each Side, on the Right and Left, it receives the *Cubitus* by two ſuperficial *Sinus*'s. It's ſecond Face, whereby it is receiv'd by the ſecond Bone of this Rank, runs from before to behind 2 ¼ Inches. It is very narrow, and only touches it's Copartner of the lower Part; for betwixt this and the other is a ſmall Cavity, whoſe

Surface compos'd by both Bones is unequal for the Inſertion of Tendons, and perforated with ſeveral Holes for Immiſſion and Egreſs of Blood-Veſſels: It's lower Surface is articulated with the outer Bone of the ſecond Rank by a *Ginglymus*, *i. e.* behind it has a *Sinus* for receiving that below it. About the Middle it has a ſmall Prominence which is receiv'd by the other, and both are conjoin'd by a plain Surface behind. From before to behind it is 3 Inches, and from the Right to the Left 4 Inches, being 1 ½ thick. It has three Protuberances; one larger at it's Outſide, more obtuſe; one leſſer below that, more ſharp, extended a little farther to cover a Part of the outer Bone of the ſecond Rank; and a third on it's Inſide towards it's Copartner: Beſides theſe, it has another ſmall Face at it's upper and back Part, which runs 2 Inches from the Right to the Left, and ½ an Inch from above to below, being alſo conjoin'd obliquely with the back Part of the *Cubitus*. This Bone weighs 6 ℥.

The Second. The ſecond Bone of the firſt Rank (2) is of the ſame Thickneſs with the former, being articulated with the *Radius*; it is 3 Inches from the Right to the Left before. At it's Middle it has a *Sinus* on each Side; one towards the former, making up with it the forenam'd Cavity, the other on it's oppoſite Side, where it receives the third Bone of this Rank; ſo that here 'tis only 2 Inches Diameter, and further back but 1 ½ Inch: From behind to before it is 3 Inches, and behind 'tis articulated with the *Radius* by a *Ginglymus* alſo, for before 'tis receiv'd by a ſmall Production of the *Radius*; about the Middle it receives the *Radius*. This Bone weighs 5 ℥.

The Third. The third Bone of this Rank (5) is only articulated with the former at the Side, where 'tis receiv'd into the fore-nam'd *Sinus*, above which it is alſo receiv'd by the *Radius*. It runs 1 ½ Inch higher than the former, and as much lower; ſo that it is 4 ½ Inches from above to below, making up almoſt the whole Inſide of the *Carpus*. It terminates above in an obtuſe Point, from thence it becomes ſtill broader, ſo that 'tis 3 Inches from above to below. At it's lower Part it reſts upon the ſecond and third Bone of the ſecond Rank: It weighs 3 ℥.

The firſt Bone of the ſecond Rank. The firſt Bone of the ſecond Rank (3) in it's fore and outer Side follows the ſame Progreſs with that above, being 6 Inches from behind to before, where 'tis conjoin'd with it's Partner; and from before, at the Articulation with it's Partner, to behind 4 Inches; from the Right to the Left behind, where it is broadeſt, 3 Inches. It's Surface behind is unequal for the Reception of Tendons. It is articulated above with the firſt Bone of the firſt Rank, and with three Bones of the *Metacarpus* below, and at it's Inſide with it's Partner of the ſame Rank. It's Articulation above is *per Ginglymum*, as is ſaid, *i. e.* before and behind 'tis receiv'd by that above, and at the Middle it receives it: It is 2 ½ Inches thick before. It weighs 6 ℥.

The Second.

The ſecond (4), which is much like to it, as being receiv'd by the ſecond above after the ſame Manner, is 3 Inches on it's convex Surface, and 2 ½ Inches tranſverſely at it's Middle. At it's Outſide, being the Inſide of the Foot, it mutually receives the

The Third.

Third (6) which runs obliquely backward 2 Inches from the former: It has four Surfaces for Articulation: one where 'tis join'd with the third Bone of the former Rank; the ſecond where it is joined with the laſt nam'd Bone: In Conjunction with the former it receives the *fifth* Bone of the *Metacarpus*, and at it's Outſide the *ſixth*. It terminates in an obtuſe Point behind, and has a *Sinus* betwixt the Articulation of the Bone of the *Metacarpus* and it's Extremity. The *ſecond* weighs 6 ℥, and this 4.

Bones of the Metacarpus. Fig. 61. *G.* 8.

There are ſix Bones in the *Metacarpus*, *per Ginglymum longum*, *viz.* they are receiv'd above by the Bones of the ſecond Rank of the *Carpus*, and below by the Toes. They are all of much about the ſame Figure, but not of an equal Length; ſomewhat flat before, and both convex behind; broader at the upper and lower Extremity where they touch one another, and narrow in the Middle.

The firſt on the Outſide is 3 Inches long, and 4 ½ Inches round it's Middle, and articulated with the external Part of the outer Bone of the ſecond Rank of the *Carpus*; in Weight 3 ℥.

The ſecond is 4 Inches long, and 5 ½ Inches round it's Middle; flat before, and more convex behind; and articulated with the Middle of the foreſaid Bone of the *Carpus*. It weighs 4 ℥.

The third is 5 Inches long, flat alſo before, and 7 Inches round it's Middle; articulated with the foreſaid Bone of the *Carpus*, and occupying moſt of it's inner Surface. It weighs 6 ℥.

The fourth is 5 Inches long, and 6 round it's Middle. This occupies the largeſt Part of the middle Bone of the ſecond Rank of the *Carpus*. It weighs 6 ℥.

The fifth is 4 ½ Inches long, of the ſame Bigneſs with the former; and occupies a Part both of the middle and of the internal Bone of the ſecond Rank of the *Carpus*; and weighs 4 ℥.

The ſixth is 3 ½ Inches long, and 5 ½ Inches round it's Middle; and occupies the external Part of the ſecond Bone of the *Carpus*; and weighs 3 ℥.

The Bones of the Toes *of the* Fore-Foot. Fig. 61. *G.* 9.

Each of the Toes of the Fore-Foot conſiſts of two thick ſhort Bones; whereof the firſt of the external Toe is 5 ½ Inches round, and 1 ½ Inch long; the ſecond about 1 Inch broad, and ½ Inch long; weighing [illegible] ℥. The firſt Bone of the ſecond Toe is 2 Inches long, and 6 ½ Inches round; the ſecond is 1 ¾ Inch from the Right to the Left, and ½ Inch from above to below; weighing 3 ℥. The firſt Bone of the third Toe is 2 Inches long, and 7 ½ Inches round: The ſecond Bone is divided into two in this Subject, in Figure not unlike an Ox's Hoof, whether it be a *Luſus Naturæ*, or peculiar to all other Animals of this Species I know not. Weight 4 ℥. The firſt Bone of the fourth Toe is 2 ½ Inches long, and 5 ½ Inches round: The ſecond Bone is in Figure not unlike the former, but not divided; from the Right to the Left two Inches, and from above to behind 1 Inch. Weight 4 ℥. The firſt Bone of the fifth Toe is 2 ½ Inches long, and 4 ½ Inches round: It's ſecond Bone is in Figure like the former, but leſs, and divided. Weight 3 ℥. The firſt Bone of the ſixth Toe is 2 Inches long, and 4 ½ Inches round; bigger at the upper and becoming narrower at it's lower Extremity, wherewith a very ſmall Bone is articulated, and weighs 1 ½ ℥.

The Oſſa Seſamoidea.

All theſe are beſides two *Oſſa Seſamoidea*, which were affix'd to the lower Part of the lower Extremity of each Bone of the *Metacarpus*; each being about an Inch long, ½ Inch broad, protuberant at the lower Part, and concave at their upper, or that Side whereby they are articulated with the *Metacarpus*; ſeparated from each other by a *Cartilage*, which did run down in the Middle of this lower *Epiphyſis* of the Bone in the *Metacarpus*. Theſe *Oſſa Seſamoidea* were very uſeful for ſupporting the Foot; for about their Middle did all the four Hoofs of the Fore-Feet terminate. They weigh each ℥ ii.

The hind Extremities conſiſt of the *Oſſa Innominata*, the Thigh-Bone, the two Bones of the Leg, and the Foot.

The Oſſa Innominata. Fig. 110, 111.

The Pelvis. Fig. 110.

The *Oſſa Innominata* conſiſting, as in other Animals, of two large Bones, articulated behind with the *Os Sacrum* on each Side, and before with each other *per Synchondroſin*, as 'tis call'd, each may be divided, as in human Subjects, into the *Ilion*, or upper and external Part, *Os Pubis*, or lower and fore Part, and *Iſchion*, or lower and back Part: Tho' ſtrictly ſpeaking, theſe Bones here ſhould only be divided into the *Ilion* and *Pubis*, there being no remarkable Part above them which deſerves to be pointed out by the Name of *Iſchion*. Both theſe *Oſſa Innominata* join'd together, make up the *Pelvis*, which in Circumference is 4 Foot 6 Inches. From the *Os Sacrum* above B, to the upper Part of the *Os Pubis* below C, it is 18 Inches, and from the Right D, to the Left E, 17 Inches. The *Os Pubis* at the Articulation is from above C, to below F, 12 Inches; betwixt the two outer and lower Extremities of the *Ilion*, from the Right G, to the Left H, is 3 ½ Foot; from the *Os Sacrum* above, along the Margin of the *Os Ilion*, down to the foremention'd utmoſt Point, is 2 Foot 9 ½ Inches G, H, and from that ſame Point H, to the *Acetabulum* which receives the *Femur* K, 1 Foot. This *Acetabulum* is in Circumference, round the external Edge, 18 Inches. The Breadth of the *Os Ilion* from the external Edge H, to the Side of the *Pelvis* E, is 13 Inches. Round the Neck of the *Ilion* above the *Acetabulum* M, M, is 14 Inches. The Height of the *Oſſa Innominata*, from the upper Part of the *Ilion* to the *Acetabulum*, 22 Inches. The Breadth of the *Os Pubis* from the Articulation with it's Partner, to the Outſide N, N, 8 Inches. The Length of the oval Hole for the *Muſculus Marſupialis* O, O, 5 ½, it's Breadth 4, it's Circumference 13 Inches. Betwixt the lower and utmoſt Extremities of the *Os Pubis* behind, R, R, 17 Inches. Theſe *Oſſa Innominata* are flat before, ſtanding almoſt perpendicular with the two lower and utmoſt Extremities of the *Os Ilion* G, H, bending forward, having the *Os Pubis* aſcending obliquely, convex before, where join'd together, concave behind. This Aſcent of the *Os Pubis* is a farther Argument, that this is no Retrocoient Animal.

Femur. Fig. 61. *L.* The *Femur* is 3 Foot long with it's upper *Epiphyſis* (1.) in Circumference 15 Inches; the Neck below it is 13 Inches; the Breadth from the great *Trochanter* (2.) on each Side 10 Inches; below this *Trochanter* in Circumference 18 Inches; about the middle 12 Inches; round above the lower *Epiphyſis* 16 Inches; round the lower *Epiphyſis* itſelf (3.), from the *Patella* (4.) on the Outſide to the oppoſite Part on the Inſide 18 ½ Inches. It's Diameter, where articulated with the *Tibia* behind is 7 Inches; having two Protuberances, whereof the external is 2 ½, and the internal 3 ½ Inches. The internal *Epiphyſis*, which is received by the *Tibia*, is from before to behind 7 Inches, and the external 5 ½ Inches. The *Femur* is in general a long ſtraight Bone, having a big round Head (which in this Subject is ſeparated from it's Body by a Cartilage, is ſtill an Argument of the Youth of the Animal) receiv'd by the *Oſſa Innominata* (1.). A large *Trochanter* on the Outſide, where the Bone is broadeſt; from thence in it's Deſcent it becomes ſmaller, flat before and behind, and thicker on the Inſide than the Outſide, near to an equal Bigneſs, till it comes to the lower Extremity, where 'tis enlarg'd into two big *Epiphyſes*, which are receiv'd by the *Tibia*, with a *Sinus* in the middle about one Inch deep, and as much Diameter. It ſends forth a large Protuberance before, which is received by the

Rotula. *Rotula*, or *Patella*, a Bone of a very rugous Surface conſiderably protuberant on the Outſide, being from above to below 8 Inches, and from the Right to the Left 6 Inches. It is articulated with the *Femur per Ginglymum*, having a Cavity on each Side which receives, and a Protuberance in the Middle receiv'd by, the *Femur*.

Tibia. The *Tibia* is in Length, meaſuring behind, 22 Inches; it's Circumference at the upper *Epiphyſis* 19 Inches, and at the Neck 17 Inches. Before, it has a large Depreſſion for facilitating the Motion of the *Patella*; of a very rugous Surface, for Inſertion of the *Extenſores Tibiæ*. 'Tis almoſt ſemicircular before, and flat behind: It's Circumference about the middle is 9 ½ Inches, and at the lower Extremity, where it again meets with the *Fibula*, and where it receives the *Aſtragalus*, 12 Inches.

Fibula. The *Fibula* is 21 Inches long; 5 ½ Inches round above, where receiv'd by the *Tibia*; 3 Inches about the middle; and 5 Inches at the lower part, where it receives the *Tibia*. It's *Epiphyſis* which forms the external Ancle, or *Malleolus*, meaſuring from before to behind along it's outer Surface, is 5 ½ Inches.

The Bones of the Hind-Foot.

The Bones of the Hind Foot conſiſt of thoſe of the *Tarſus*, *Metatarſus*, and Toes. The *Tarſus* conſiſts of 6 Bones, whereof

Aſtragalus. Fig. 115.

The *firſt* is call'd *Aſtragalus* (1.). This is articulated above with the *Tibia*, having a Depreſſion in the middle 3 Inches, which receives; and two Protuberances at the Sides, which are receiv'd by, the *Tibia*; 3 ½ Inches. It receives the *Talus* below with a Surface 4 Inches Diameter. On the Inſide it ſends forth a large Protuberance; and on the Outſide both it and the *Talus* are receiv'd by the external *Malleolus* for the Space of 2 Inches. Before, 'tis receiv'd by the *Os Naviculare* during the Space of 4 ½ Inches. It is in Weight 6 ℥.

Talus. Fig. 113.

The *Talus* (*a.*) is a very irregular Bone; it is protuberant behind from the *Aſtragalus* 4 ½ Inches. This Protuberance is in Circumference at the Extremity 10 Inches, and at it's Neck 8 Inches: Below, it is very rugous on the Inſide. It ſends forth a Protuberance which is received by the *Aſtragalus*, as in Human Subjects. It has three remarkable Surfaces; *viz.* one upon which the *Aſtragalus* reſts, at it's upper Side; one at the fore-part, articulated with the *Oſſa Cuneiformia*; and the Outſide, for the *Fibula*. It weighs 1 ℔.

Os Naviculare. Fig. 115.

The *Os Naviculare* is 10 ½ Inches in Circumference, one Inch thick, concave behind (2.) where it receives the *Aſtragalus*, and convex before with it's different Surfaces (3.), *viz.* one whereby it is articulated with the Bone of the Toe on the Inſide, and one for each of the three *Wedge-like* Bones. It weighs 4 ℥.

Oſſa Cuneiformia. Fig. 115.

The Bones of the ſecond Rank of the *Tarſus* are called the three *Wedge-like* Bones, two of which are articulated at the back-part with the *Os Naviculare*, as is ſaid, and the third partly with the *Talus*, and partly with the *Os Naviculare*; each of them is about one Inch thick; that on the inner Side (4.) is the leaſt, being from the right to to the left one Inch thick, in Weight ℥*ſs*: The middle 2 Inches (5.) in Weight ℥*ij*; and that on the Outſide (6.) 3 ½ Inches, in Weight ℥*iij*. This laſt has two Surfaces at the fore-part, whereby 'tis articulated with the two utmoſt Bones of the *Metatarſus*. The middle Bone of the *Tarſus* being only receiv'd by the middle Bone of the *Metatarſus*.

The Bones of the Metatarſus.

The external Bone of the *Metatarſus* is very irregular: It is articulated behind with the external *Os Cuneiforme*, where 'tis about two Inches from above to below; from whence (it's external Surface being very rugous) it becomes gradually ſmaller; being ſomewhat concave below, and protuberant above, till it terminates in a round Extremity. In Weight ℥*ij*ſs.

The ſecond is a ſhort thick Bone, 8 Inches in Circumference, and 2 ½ Inches long; in Weight ℥*ij*ſs. This receives the firſt Bone of the Toe, which is 4 ½ Inches in Circumference, and 2 long; and receives the ſecond Bone of the ſame Toe, being 3 in Circumference, and 1 ½ long; greater at it's upper, and ſmaller at it's lower Extremity, to which is affix'd a ſmall Bone. Theſe weigh ℥*iij*ſs.

The middle Bone of the *Metatarſus* is the largeſt of all thoſe belonging to the Toe, being 7 Inches round, and 5 long; ʒ *iiij* in Weight. It receives the firſt Bone to the Toe, which is $4\frac{1}{2}$ Inches round, and $2\frac{1}{2}$ long; to which alſo is join'd another ſmall Bone to make up the Extremity: in Weight both ℥iiij.

The two Bones of the *Metatarſus* remaining are thin, broad, and irregular; the firſt whereof is $2\frac{1}{4}$ Inches broad, and $2\frac{3}{4}$ long; weighing each ℥j, to which alſo adheres a ſmall Bone, as in the former Toe, but leſs. The ſecond and laſt of the *Metatarſus* on the Inſide is two Inches broad, and as much long, thin like the former, having a ſmall Protuberance adjoin'd inſtead of a Toe. The Bones of the 4th Toe weigh ℥*jſs*, and the 5th ℥*j*.

Compariſon *of theſe Bones with thoſe treated of by* Tentzelius.

I deſigned to have compar'd more particularly the Bones now deſcrib'd, with thoſe of *Tentzelius* and Dr *Moulins*: But ſince both thoſe Treatiſes are extant, and ſince I have already inſiſted ſo long upon theſe, I ſhall only obſerve, in a few Words, that *Tentzelius* tells his Friend, That in digging in a Hill near *Erfurt* in *Germany* for a fine white Sand, there were found ſeveral huge Bones, firſt miſtaken for a Giant's; but upon Tryal, and the Peruſal of Dr *Moulins*'s Treatiſes, known to be the Bones of an *Elephant*: And that among the reſt there were found the Head 42 Inches Diameter; two Tuſks $2\frac{1}{2}$ Spans large, and 8 Foot long; four Grinders, each, 12 ℔; the *Humerus* 4 Foot $2\frac{1}{2}$ Spans; the *Vertebra* of the Neck, each 4 Spans in Circumference, and 2 Spans high; the *Oſſa Innominata* $2\frac{1}{2}$ Foot long; with the Head of the *Femur* inſerted in the *Acetabulum*, and Part of the *Tibia* 22 Inches at the biggeſt, and 17 at the ſmalleſt Part: That they were obliged to dig 24 Foot deep, before they could get out the Head; that the Bones lay in ſuch a Poſture, as betoken it's being overwhelm'd, or having had great Strugglings while dying; *viz.* the left fore Foot ſtretch'd forward to the Side of the Head, which lay towards the North, the Right inclining backward under the Body; the Left hind Foot drawn in toward the Body, and the Right diſtorted here and there, out of it's Natural Poſture. From all which he concludes this to have been the largeſt *Elephant* that ever was ſeen in *Europe*; and that it could be brought hither by no other means than the Flood, both from the preternatural Poſture of the Body, and from the different *Strata* of Earth lying above it, without the leaſt Sign of having been digg'd to bury it.

A TABLE *containing the particular Dimenſions of the* Vertebræ *and* Ribs, *and Weight of all the* Bones *of the Elephant.*

The Bones of the Head.	*lb.*
Upper Jaw	66
Lower Jaw	45

The *Vertebræ* of the Neck.

Numb.	Weight. *lb.*	*oz.*	*dr.*	Length of Spinal Proceſs. Inch.
1	1	13		
2	1	6	4	
3		13	4	¾
4		13	4	½
5		14	4	1½
6		14	6	3
7	1			5
	7	10	6	

The *Vertebræ* of the Tail.

Numb.	*oz.*	Length. Inch.	Breadth. Inch.
1	10	2	6
2	8		5½
3			5
4	6		4½
7			4
8	5		
9	4		3½
10			3
11	3		2½
— 13 —	2⅔		
14	2½		1½
15			1
16	1¼		2½
17	1		
18		1⅔	
— 20 —		1½	
21		1¼	
22		1	2¼
23	⅔		2
24			1½
25	½	½	
— 29 —	⅔		

The *Vertebræ* of the Back. / The Ribs.

Num.	Weight.			Leng. of Spinal Proceſs.	Breadth of Extrem.	Weight.			Leng. of Inner Surface.		Leng. betw. Extrem.		Breadth of Extrem.
N°	*lb.*	*oz.*	*dr.*	Inches.	Inches.	*lb.*	*oz.*	*dr.*	Feet.	Inch.	Feet.	Inch.	Inches
1	2	4		8	2	1	13		1	5	1	4	4
2	2	2		12	3½		12	4		9		8	3
3	2			13	4½	1	1	2		11½		10	
4	1	5					5		2	2	2		
5	1	4	2	12	3½		8	4		6		3	2½
6	1	2	3	11½	3		2	3				3½	
7		15	6	11			1	5		8		3¼	2½
8		14		10½	2½		4	6		10		4½	
9		14		10			3					5	
10							15			9		3	
11							14	4		7			
12		13		9½	2		13	4		5		1	
13				9			12			4			
14					½		10	6		½	1	11½	
15				6½	1½		9					10	1
16				6	2		5	5	1	9		8	
17				5			5			8		7	
18			2	4½			3	2		5		4½	
19			4	3			2	1					
	20	8	7			16	15	6					
						16	15	6					

The *Vertebræ* of the Lions.

1	13	4	3	Weight of Ribs.	33	15	4	
2	12	7		Tail	4	2	7	1 *ſcr.*
3	11							
2	5	3						

The Skeleton of the Elephant *conſiſts of the Bones of*

		lb.	*oz.*	*dr.*	*ſcr.*
The Head, divided into thoſe of the					
Upper Jaw, *viz.*					
Calvaria, or upper and back-part	1				
Frons, or upper and fore-part	1				
Two *Maxillary* Bones	2				
Two Bones of the Palate	2				
Two *Zygomatick* Bones	2				
Two *Styloid* Proceſſes	2				
Two Tusks	2				
Four Grinders	4	66			
Lower Jaw	1				
Four Grinders	4	45			
	21	111			
The Trunk compoſed of the					
Spine, conſiſting of the *Vertebræ* of the					
Neck	7	7	10	6	
Back	19	20	8	7	
Loyns	3	2	5	3	
Os Sacrum	5	4	0	0	
Tail	29	4	2	7	1
Ribs, 19 Pairs.	38	33	15	4	
Sternum	4	3	0	0	
	105	75	11	3	1
The Fore Extremities,					
Scapula	2	19	8	0	0
Humerus	2	16	0		
Cubitus and *Radius*	4	15	0		
Carpus, Six on each Foot	12	3	12		
Metacarpus	12	3	4		
Toes	24	2	3		
Oſſa Seſamoidea	24	0	6		
	80	60	1		
The Hind Extremities,					
Oſſa Innominata, viz. *Ilion* *Pubis*	2	28	0		
Femur, or Thigh Bone	2	16	0		
Tibia and *Fibula*, or Leg and Spit-Bone	4	13	4		
Patella, or Knee-Pan	2	0	12		
Tarſus	12	5	10		
Metatarſus	12	1	6		
Toes	20	1	2	½	
	54	66	2	½	
Summa Totalis.	260	312	14	7	1

This is the Total Sum of the Weight of the Bones.

I come

The Method of Mounting *the* Skeleton.

I come now to deſcribe the Method I us'd in mounting the Skeleton; and becauſe Dr *Moulins*'s Way of nailing a Plate of Iron to the Roof of the Mouth, in which the Iron Rod that ran through the *Vertebræ* of the Neck was faſten'd, would have been inconvenient, by ſpoiling the back-part of the Skull, obſtructing it's View, and making the Head look too much forward, which was the Fault of his Skeleton, as repreſented by the Figure I contriv'd another, which is as follows.

Connexion of the Head.

There was an Iron Rod made about the Bigneſs of one for a Bed, as long as the *Elephant*, from the Forehead to the Point of the Tail, being 14 Foot, which paſſed in at the fore-part of the Skull above the Hole for the Root of the Trunk, and ran back amidſt the fore *Cellules*, paſſing along the lower part of the Seat of the Brain, and going out at the lower part of the Hole for the Spinal Marrow; and leſt the Inconveniency of it's Weight (as Dr *Moulins* fear'd) ſhould happen to break the tender *Laminæ*, there was another Rod of the ſame Bigneſs, which paſs'd in at the one Side of the Head, where the Depreſſion is for Inſertion of the Muſcles of the lower Jaw and *Proboſcis*, and ran through the *Cellules* at the Side, going tranſverſely along the lower Part of the Seat of the Brain, below the former, and paſſing out at the other Side; by which this Rod, from the Right to the Left, eaſes the Burthen of the other, in ſupporting the Head on both Sides, as well as the other did before. And leſt any of theſe ſhould ſlide out, I caus'd to be ſcrew'd a Piece of Iron upon each Extremity of that which paſs'd from the Right to the Left, and upon the fore-end of that which did run from before to behind. Afterwards the ſecond *Vertebra* in the middle of it's Tooth, and all the other following *Vertebræ*, were perforated in the Center of their Bodies; and to make the Head ſtill more ſteady, the Baſe of the Skull was twice perforated on each Side of the Hole for the Spinal Marrow; and a ſtrong Wire being paſs'd through theſe Holes, it ran from the Right to the Left above the Rod, and kept it firm, leſt it ſhould have bended, and ſuffer'd the Head to incline too much downward by it's Weight.

The Connexion of the Lower Jaw.

Fig. 64.

The joining of the lower Jaw, which is perhaps the moſt ponderous Bone in any Land Animal, was next to be conſider'd; therefore two Wires were paſſed in at about one Inch diſtant from each other, running from above to below, to that Part of the Baſe of the Skull (*y.*), which is for the Reception of the *Condyles*; and the ſame two Wires having paſs'd through two Holes, made from before to behind in the *Condyles* themſelves, both Extremities of the Wires were made to meet together at the upper and outer Part of the *Condyles*, and ſo twiſted and made firm. Being ſtill ſuſpicious that this would not be ſufficient to ſupport ſuch a vaſt Weight, and fearing leſt either the Baſe of the Skull or the *Condyles* might come to ſuffer, there was a Wire brought round the Margin of the ſo-often mention'd great Hole in the *Os Maxillæ Superioris*, which being folded, was twiſted ſeveral times toward the *Proceſſus Coronæ* in the lower Jaw (*b.*), where there were two

Latchets, or Foldings of Wire plac'd in the inner Side; the folded Wire from the *Os Maxillæ*, was brought in betwixt them, and a Pin paſs'd through all three, to be taken out at Pleaſure. And leſt theſe ſhould not ſtill be ſufficient to ſupport it's Weight, there was provided in the third Place a folded Wire from behind to before in the *Symphyſis Menti (b,)*, which paſſing in betwixt the two *Oſſa Palati (b.)* a Pin was put acroſs them, to be taken out at Pleaſure; which is ſuch a Relief to the *Condyles*, that without making uſe of the Wires running from the *Os Maxillæ* to the *Proceſſus Coronæ*, we found it ſufficient to ſupport the Weight of the Jaw; and 'tis ſo much the more convenient, that by pulling out this Pin, the lower Jaw can be brought back and forward, to ſhew the Spectators it's conſiderable Weight.

Fig. 70.
Fig. 61.

Connexion of the upper Part *of the* Skull.

Being obliged to ſaw the Skull, in order to take out the Brains, for faſtening the upper part of it, there were two wires plac'd at the back-part of that which is below the Diviſion; into which are linked two other Wires, which reach to that Part above the Diviſion, and are there receiv'd into two Foldings of Wire plac'd there on Purpoſe. The ſame Contrivance is alſo obſerv'd before; ſo that this upper Part may either be laid back, to ſhew the Structure and Contrivance of the *Cellules*, or taken altogether off, as ſeems good.

The Joining of the Vertebræ *and* Ribs.

The *Vertebræ* being all perforated, my next Care was to have the Ribs match'd and join'd; in order to which, having firſt ſuited them in Pairs and fitted each Pair for it's *Vertebræ*, I caus'd to be perforated each of their *Epiphyſes* twice from above to below, (once toward the fore, and once toward the back-part) and the tranſverſe *Proceſſes* of the proper *Vertebra* oppoſite to the Holes of the Ribs, after the ſame Manner; and then perforated the Extremity toward the *Vertebræ*, and the *Sinus* of the *Vertebræ* (correſponding to the Rib) in towards it's Body: After which a Wire two Inches long was faſten'd in the Body of the *Vertebræ*, and Extremity of the Rib, and then both were brought together; which being done, the Wires were put into their reſpective Holes in the tranſverſe *Proceſſes* and Ribs, and both the Ends of each of the two laſt Wires being brought together at the upper Part and Interſtice betwixt the Ribs and tranſverſe *Proceſſes*, were twiſted and made firm. Thus I continued to do throughout all the nineteen Pairs.

Leather, inſtead of Cartilages.

After this, I provided ſome Jumps, or Leather, ſuch as Shoemakers uſe for the Heels of Shoes, becauſe the Bend or Sole Leather us'd in mounting the Skeltons of other Animals, could not be ſo conveniently fitted to it's Thickneſs. Having wetted and beat this Leather, it was ſhaped according to the Bigneſs of each *Vertebra*, perforated in the Middle, and put upon the Rod alternatively, firſt the *Vertebra*, and then the Leather, to ſupply the Defect of the Cartilages, which were all loſt in Boiling, as uſually happens, and was beat ſo cloſe, that the oblique *Proceſſes* of the *Vertebræ* might meet. This was continued till all the *Vertebræ* were upon the Rod, all along to the *Os Sacrum*; and becauſe the firſt *Vertebra* is nothing concern'd with the Rod, 'twas convenient to paſs a Wire betwixt the Skull and it on each Side, that it might not remain looſe, but be fixed to the *Condyles*, by twiſting and making faſt the Wire.

Connexion of the Oſſa Innominata.

I come next to the *Oſſa Innominata*, which had been disjoin'd in Boiling, both before or below at the *Os Pubis*, and above or behind at the *Os Sacrum*. I made two Rods of Iron to paſs tranſverſely from the one Side (the one above, and the other below) through the *Os Sacrum* to the other. Theſe were riveted on the back Side at both Ends; and then having perforated the *Os Sacrum* from above to below through the Middle of it's Body, it was alſo put upon the Rod for the Spine, which was a very difficult Taſk, becauſe the Rod being thick, was uneaſy to bend, and the Situation of the *Os Sacrum* requir'd it to be bended preciſely betwixt the laſt of the *Vertebræ Lumbrorum*, and the *Os Sacrum*. Neither was it eaſy to proforate the *Os Sacrum* itſelf, being obliged to make a Drill on purpoſe, there being no other Bone in the Body that requir'd one ſo long. After this, I proceeded to put on the Bones of the Tail, and their ſham Cartilages alternatively, as they followed in order, till all the Rod was filled, on whoſe Extremity another Piece of Iron was ſcrew'd, to keep all firm and ſecure.

Connexion of the Sternum, *and mounting the* Thorax.

Afterwards a large Wire was paſſed from the fore to the hind-part of the *Sternum*, whereby all it's Bones were fix'd to one another; and to them were joined Pieces of Bend-Leather to ſupply the Cartilages, which had been firſt mangled by the Butchers, and then loſt in the Boiling. Theſe I fitted to the Articulation of each Rib, whereto they were join'd; and perforating the Extremities of the Ribs twice, I paſs'd two Wires betwixt the ſham Cartilages and them, bringing the two Ends together, twiſting and faſtening them on the Inſide, by which all the *Thorax* was mounted. And leſt the Ribs thus fix'd at both Extremities ſhould be too ready to move from before to behind, and *è contra*, each of the Ribs was perforated above toward the Back, and below toward the Belly, for receiving of Foldings and Latchets of Wires to be faſten'd in them. Then I provided two big Wires, each being folded twice, the Length of the *Thorax*; one of which being paſs'd through the laſt Rib, it's two Parts being brought together, they were twiſted ſeveral times, till it was brought oppoſite to the Latchet in the next Rib, within which the one Parr was paſs'd, the other continuing without, and then twiſting again, till it came to the third; it was ſo continued throughout all the Ribs, both above and below, to keep them firm and at a due Diſtance.

The Joining of the Scapulæ.

Next, I took the two *Scapulæ*, as belonging to the upper Extremities; and leſt they ſhould be too weighty for the Ribs, if nail'd to them, as is uſually done in other Skeletons, I thought fit to perforate both of them oppoſite to one another at their upper Margin, and to paſs a good big Wire through one of the Perforations, which being folded, was twiſted for the Space of 20 Inches, *i. e.* from the *Scapula* on the one

Side, ſtraight over the Back, paſſing in betwixt two of the *Vertebræ*, till it came to that on the other, where it was faſten'd. Afterward both the *Scapulæ* were faſtened, by bringing two folded Wires from the Outſide of each *Scapula*, through the firſt and third Rib, in whoſe Inſide they were fix'd; then was the Head of the *Scapula* perforated through the Margin which guards the *Humerus* at the fore and back-part.

Connexion of the Humerus.

The Head of the *Humerus*, oppoſite to the Middle of the Concave Part in the *Epiphyſis* of the *Scapula*, was four times perforated, twice toward the Inſide, and twice toward the Outſide; whereunto were put two folded Wires, whoſe Extremities were fix'd below at the foreſaid inward and outward Part, and into whoſe Foldings a large Pin paſs'd from the Margin of the *Scapula* on the one Side, to that on the other, (to be pull'd out at Pleaſure) for ſuſpending of the *Humerus*.

Cubitus *and* Radius.

The *Cubitus* and *Radius* were join'd with the *Humerus*, thus: the *Cubitus* was perforated twice in the back-part, at the Beginning of the *Olecranon* on each Side; where two Extremities of Wires being fix'd and riveted, they were brought through the upper-part of the ſaid *Olecranon*, and then twiſted, till they came to the *Humerus*, which was perforated from the back-part, where the Depreſſion for receiving the *Olecranon* is, to the fore-part above the *Epiphyſis* receiv'd by the *Cubitus* and *Radius*; through which Holes, made pretty large, the Wires thus twiſted were paſs'd, the one to the *Radius* on the Outſide, and the other to the *Radius* on the Inſide; where they were introduc'd, and brought out at the back-part of the *Cubitus*, below the *Olecranon* on each Side, where their Extremities were revited 2 ½ Inches below their Inſertion: by which means the Flexion and Extenſion can be eaſily ſhewn, becauſe the Wires have ſufficient Space to move in their Paſſage through the *Humerus*, theſe Holes being made bigger on Purpoſe, as is ſaid. The lower *Epiphyſis* of both *Cubitus* and *Radius*, having been ſeparated by Boiling, as I have formerly obſerv'd, I was forc'd to perforate each of them below toward the *Carpus*, and paſs a Wire obliquely upward, whereby to ſecure them: And becauſe the *Radius* is diſtinct from the *Cubitus* below, there was a Wire paſſed from the one to the other, and riveted at each Outſide.

The Fore-Foot.

In joining the Bones of the Foot, I took ſpecial Care to hide the Wires that none might appear: For doing whereof the *Cubitus* was twice perforated in the back-part of the *Epiphyſis*, about 1 Inch above the Articulation with the Bone of the *Carpus* on the Outſide, and the *Radius* in the Inſide and Back-part, after the ſame Manner. Both which Perforations were continued through the two Bones of the firſt Rank of the *Carpus*. Afterwards the External Bone was perforated a third time; all which run from above to below, to the firſt, ſecond and third Bone of the ſecond Rank. Which being done, two folded Wires were paſſed in at the four Holes of the back-part of the *Cubitus* and *Radius*, where their Duplicatures were formed; and the fifth Wire put into the Hole made in the Middle of the External Bone of the firſt Rank of the *Carpus*, was continued with the reſt through the Bones of the ſecond Rank to thoſe of the *Metacarpus*, where they run from one Extremity to another; that is to ſay, the outer Part of the folded Wire from the *Cubitus*, did run down the Outſide of the External Bones of the firſt and ſecond Rank of the *Carpus*, to the External Bone of the *Metacarpus*, all along, till it was brought out at the Extremity of the furtheſt Bone of the Toe belonging thereto; and the inner Part of the ſame Wire paſſing from the *Cubitus* through the ſame two Bones of the *Carpus*, ran down to the third Bone of the *Metacarpus*, from the Outſide, from whence 'twas convey'd to the Extremity of it's Toe, and there riveted. The third Wire paſs'd from it's Entry, in the Middle of the external Bone of the firſt Rank of the *Carpus*, to that of the ſecond, and from thence down to the ſecond Bone of the *Metacarpus*, from the Outſide, to the Extremity of the Toe, where it was faſten'd; and the folded Wire from the back-part of the *Radius* paſs'd down at two Places through the middle Bone of the firſt Rank of the *Carpus*, to that of the ſecond Rank, and from thence to the fourth and fifth Bones of the *Metacarpus*, from the Outſide, and ſtill forward to the Extremities of their Toes, where they were fix'd. This done, I caus'd to be perforated the External Bones of the *Carpus* twice, *i. e.* toward their fore and back-part, as alſo the *Metacarpus* at the upper and lower Extremity; paſſing the Drills from the Outſide to the inner of each Bone, or from the Right to the Left, by which the Bones above were as well join'd with their Sides, as with thoſe below them, ſo that each was kept ſecure in it's Place, eſpecially the Bones of the *Metacarpus*, which would have too readily ſeparated from each other, and endanger'd the breaking the Wires, by which they were join'd with thoſe above. Since the third Bone of the firſt Rank of the *Carpus* lies, as it were, at the Side of both Ranks, therefore I thought it convenient to paſs the two Extremities of the Wire, which run from the Right to the Left, in the firſt Rank, that ſo it might be faſten'd with it's Partner on the Inſide; and ſince the Internal Bone of the *Metacarpus* yet remain'd to be join'd, this inner Bone of the *Carpus* was again perforated, and a Wire brought from it to the inner Bone of the Bone of the ſecond Rank, and from thence to the ſaid Bone of the *Metacarpus* with it's Toe, where it was faſten'd.

Connexion of the Femur.

The upper *Epiphyſis* of the *Femur* having alſo been ſeparated by Boiling, it was requiſite to perforate it's Head four times, for the Immiſſion of two folded Wires, which were brought obliquely down the inner and outer Side to it's Neck, where their Extremities were twiſted and ſecured. Afterward it was perforated in the Middle four times, for two other folded Wires, which were once or twice twiſted, and their Extremities put through the aforeſaid Holes to the inner and outer Part of the Neck of the *Femur*, as before, there to be made faſt. The *Acetabulum* was perforated in the Bottom, and theſe two Foldings paſs'd thro' it; whereinto was put a Pin, at the back-part of the *Oſſa Innominata*, to be pull'd out at Pleaſure, and the Thigh ſuſpended as the *Humerus*.

Of the Tibia *and* Fibula.

Two folded and twiſted Wires paſs'd in at the *Epiphyſis*, on each Side of the *Spina*, in the Middle of the *Tibia*, and their Extremities brought out at it's upper and back-part, where they were riveted: Afterward the lower *Epiphyſis* at the *Femur* was perforated from the Right to the Left, and a Pin paſſed from the Outſide, through the Foldings of the Wires from the *Tibia*, to the Inſide, (whereby the Flexion and Extenſion is moſt conveniently ſhewn) to be taken out at Pleaſure. The *Perone* was fix'd to the *Tibia*, at the upper Part, by a Pin obliquely upward from the one to the other; and the *Patella* faſten'd to the fore-part of the *Femur*, by a Pin paſſing directly inward from before to behind.

Of the Hind Foot.

The lower Part of the *Perone* forming the External *Malleolus*, is perforated from without to within, as is the oppoſite Part of the *Tibia* forming the Internal one; likewiſe the *Aſtragalus* is perforated from the Right to the Left, correſponding to theſe two Holes, for the Immiſſion of a Pin, whereby the Foot is join'd to the *Tibia*, to be pull'd out at Pleaſure. The *Aſtragalus* is join'd to the *Talus* by a Pin, paſs'd from the upper and middle Part of the one, to the lower Part of the other, where it is riveted. The *Aſtragalus* is thrice perforated before; into two of which Holes a folded Wire is paſs'd, which goes forward through the *Os Naviculare* to the Bones of the *Metacarpus* of the ſecond and third Toe from the Inſide, at whoſe Extremities they are fix'd. The third Wire runs from the *Aſtragalus* to the *Os Naviculare*, and the third *Os Cuneiforme* to the fourth Toe. The ſaid *Os Naviculare* is perforated on the Inſide for a Wire, which runs through the Bone of the *Metacarpus* and inner Toe. The third *Os Cuneiforme* is perforated for a Wire which paſſes through the Bone of the *Metacarpus* and outer Toe. The three *Oſſa Cuneiformia* are join'd to each other by a folded Wire, which runs twice from their Outſide to the Inſide, where they are ſecured.

As to the Structure of the Bones, the Deſign of preſerving the Skeleton entire, gave me no Liberty to go any further than their External Surface, ſo it cannot be expected I could dive any deeper in the Knowledge of them. *Tentzelius* ſays, *Omnia iſthæc Oſſa paroſa ſunt & rimoſa*; and I may add, *levia* too: For there is nothing about them to be ſeen of that Solidity and Compactneſs, that Smoothneſs of Surface, and Whiteneſs, which is obſervable in other Quadrupeds of the larger Size, ſuch as Oxen, Horſes, Harts, *&c.* And I ſhould have readily attributed this to the Youth of the Animal, had not *Tentzelius* from his Subject, ſuppos'd to be 200 Years old, told the ſame. And this differs much from the Account of the *Behemoth* in *Job*, whoſe Bones are ſaid to be as ſtrong Pieces of Braſs, and Bars of Iron. The *Laminæ* of the Head were thin and ſolid; the External Table thin and more ponderous ; the Teeth exceeding ſolid and ponderous : So that from the Computation of the Weight of the upper-part, which was taken off by the Saw, as in *Fig.* 66 and 67, which is only 6 ℔ Weight, may reckon all the Head, which weighs 66 ℔ beſide the Teeth, not to weigh above 24 ℔ at moſt ; which well agrees with what *Tentzelius* ſays, that each of the *Dentes Molares* were 12 ℔ Weight, and that of all the 45 ℔ which the lower Jaw weighs, the reſt of the Bone beſide the Grinders do not exceed 12 or 16 ℔. For it's External Surface ſeems to be both porous and rimous, as is ſaid ; and at perforating the *Condyles* ſeem'd to be very ſpongy, as were the Ribs, *Femur*, *Tibia*, &c. where, after the Drill had paſs'd the External *Lamina*, which was very thin, it would have run forward, as if it had been through ſo much Moſs. When the *Epiphyſis* came off the Thigh-bone, it reſembled very much the *Epiphyſis* of the *Femur* in Man ; it's minute *Cellules* were not ſo big as thoſe of an Ox, and the *Laminæ* which circumſcrib'd them, not by much ſo ſolid. The *Humerus* indeed both above and below was much harder ; it did heat the Drill in paſſing: And there may be ſome Reaſon for that too ; *viz.* that ſince the Progreſſion of moſt Quadrupeds chiefly depends upon a more frequent Motion of the Fore than Hind Limbs, it does much more here, where the Head is proportionably more heavy than in other Animals. And this perhaps is the Reaſon too, why the Fore-limbs in this Animal are brought ſo far forward ; for meaſuring in a ſtraight Line from the *Humerus* above to the *Carpus* below, and bringing another Line directly backward at the Articulation betwixt the *Humerus* and *Cubitus*, from the perpendicular Line before, to the Point of the *Olecranon* behind, it was 20 Inches ; which is the Reaſon why ſome think the Engraver has made the fore Limbs of the Skeleton to bend too much at the Articulation. The Bones of the *Carpus* are pretty ſolid, and by Perforation they ſeem only to have a little Spongioſity about the Middle : All the reſt of the Bones of the Fore-foot are ſpongy. The *Aſtragalus*, *Os Naviculare*, and *Oſſa Cuneiformia*, are more ſolid ; but the *Talus* and other Bones of the Hind-Foot ſpongious. The Spine was ſpongy, as is uſual ; the *Oſſa Innominata* of a Middle Conſiſtence ; and the *Scapula* very thin, but ſolid toward it's Neck. I cannot poſitively determine the Cavities for the Marrow, nor Quantity of it ; but by comparing the Dimenſions with the Weight and ſmall Quantity of Fat to be ſeen at the Boiling, we may ſuppoſe it not to have been much in this Animal : I know not how it may be in others of this Species.

I muſt not omit obſerving, that when I weighed the Bones, it was immediately before they were joined ; ſo that their Weight was much diminiſh'd, in reſpect of what it was when they were newly boil'd. The Weight is ℥16. to 1 ℔ and the Meaſure, according to the *Engliſh* Yard, 12 Inches to a Foot, and 12 Lines to an Inch.

Fig. 60. *Repreſents the ſtuff'd Skin of the Elephant, as it now ſtands in the Hall at* Dundee, *with an Account of it's particular Dimenſions.* Fig. 60.

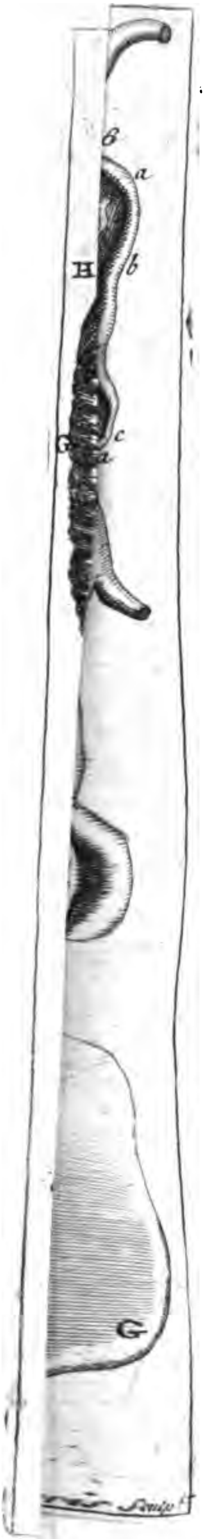
	Feet	Inch.
A, A, The Height of the *Elephant* at the Fore Feet.	8	6
B, B, It's Height at the Hind Feet.	9	
C, C, It's Length.	10	
C, D, The Length of the Tail.	4	3
E, E, The Circumference of the Belly.	14	
F, F, From the top of the Head to the Point of the *Proboſcis.*	8	
G, F, The Length of the *Proboſcis.*	4	6
H, H, The Diſtance between the Forehead and lower Jaw.	2	3
F, I, From the top of the Head to the lower Jaw.	4	6
K, K, The Length of the Ear.	1	7
L, L, It's Breadth.	1	5
M, The Orifice of the *Meatus Auditorius.*		
N, N, The Circumference of the Fore-foot round the Hoofs.	3	10½
a, The Fore-hoof Fore-ſhorten'd.		5
b, The middle External Hoof.		5
c, The third External Hoof.		4
Note, That neither the Diameter of the Fore-foot from before to behind, which was —	1	4½
nor from the right to the left, which was —	1	2
can be ſo here.		
O, O, The Circumference of the Fore-foot at the upper Joint.	4	3
P, P, At the Articulation with the *Carpus.*	2	6½
Q, Q, The Circumference of the hind Foot round the Hoofs.	3	4
The Diameter from before to behind.		
From the right to the left.		
a, The Breadth of the fore Hoof.		3
b, The Breadth of the outer Hoof.		4
c, The Breadth of the third Hoof.		4
R, R. The Circumference of the hind Leg.	2	2

S, The Mouth. T, The Tuſks broken off by the Middle. U, The Eye. X, Repreſents the Scabs about the Belly. Y, Y, The Depreſſions in the Skin thro' the Folding of the *Proboſcis.* *a*, A Protuberance firſt occaſion'd by the *Oſſa Innominata*, when the Animal was alive and very lean, and ſtill remaining in the Skin. *b*, A Protuberance in the Fore-part of the Thigh. *c*, The lower Joint of the Fore-foot, where there is a Depreſſion in the Skin. *d*, *d*, Several Wrinkles in the ſtuff'd Skin.

Fig. 61.

Fig. 61. *Repreſents the Skeleton of the Elephant, as it now ſtands in the Repoſitory of Rarities in* Dundee.

Fig. 61. A, The Skull taken in Profile, whereby a Part of the fore Side is fore-ſhorten'd. *a*, The Hole for the Root of the Trunk fore-ſhorten'd. *b*, *b*, The two *Oſſa Palati.* *c*, *c*, The two Tuſks as they proceed from the *Oſſa Palati.* *d*, *d*, The broken off Extremities of the Tuſks. *e*, The Grinders of the upper Jaw. *f*, The fore Grinder of the lower Jaw. *g*, The undulating Lines of the lower Surface of the Grinders of the upper Jaw. *h*, The inner Grinder of the lower Jaw. *i*, Part of the *Os Malæ.* *k*, It's Articulation with the *Os Zygomaticum.* *l*, The *Os Zygomaticum.* *m*, The Orbit of the Eye. *n*, It's upper Protuberance. *o*, It's middle Protuberance where the *Trochlea* is inſerted. *p*, It's lower Protuberance. *q*, A *Sinus* at the Bottom of the Orbit *r*, *r*, A Depreſſion fit for lodging the Muſcle, of the lower Jaw and *Proboſcis.* *s*, The Orifice of the *Meatus Auditorius.* *t*, *t*, The Articulation of the *Os Calvariæ* with the *Os Zygomaticum.* *u*, The *Proceſſus Coronæ* of the lower Jaw. *x*, The Inſertion of the *Muſculus Maſſeter.* *y*, The Space for the Mouth betwixt the *Os Palati* and lower Jaw. *z*, An Orifice from which the *Nervus Maxillaris inferior* proceeds. B, The *Vertebræ* of the Neck. 1, The firſt *Vertebra.* 2, The ſecond *Vertebra*, or Tooth, which riſes higher than the reſt. 3, The third *Vertebra* having ſcarce any Spinal Proceſs. 4, The 4th, whoſe Spinal Proceſs is not yet ſeen. 5, The 5th, with the Spinal Proceſs beginning to appear. 6, The 6th, whoſe Spinal Proceſs aſcends higher, and is remarkable at it's fore-part, as in *Fig.* 104, 105. 7, The 7th, whoſe Spinal Proceſs ſtill aſcends, and with whoſe back-part the firſt Rib is articulated. C, The *Vertebræ* of the Back. 1, —— 13, Their *Proceſſus Spinoſi*, which have no Protuberance at their Extremity, whereof 1, —— C, are the longeſt, and C, —— 13, become gradually ſhorter. D, The Spinal Proceſſes of all the reſt of the *Vertebræ* to the *Os Sacrum*, which are ſhorten'd by Degrees. xxxxx &c. The oblique Proceſſes of the *Vertebræ.* E, The *Scapula.* *a*, *a*, The ſpongious Margin of the *Scapula.* *b*, *b*, It's *Proceſſus Spinoſus* ſending forward a Protuberance. *c*, *c*, It's Neck. *d*, *d*, The *Epiphyſis* which receives the *Humerus.* *e*, *e*, &c. The Ribs. *f. f.* &c. The Ribs which appear on the oppoſite Side. *g*, *g*, The Cartilages of the *Sternum.* *h*, *h*, The Bones of the *Sternum.* *i*, *i*, *i*, The three Ribs which have no Cartilages. *l*, *l*, *l*, The Bodies of the three *Vertebræ Lumborum.* F, The *Humerus.* 1, It's upper-part, ſpongious and rugous, for the Inſertion of Tendons. 2, It's middle-part more ſolid. 3, a large oblique *Sinus* for lodging the *Biceps.* 4, It's lower Extremity articulated with the *Cubitus* and *Radius.* G, The *Cubitus* and *Radius.* 1, The *Olecranon.* 2, An Hollowneſs on the Outſide of the *Cubitus.* 3, The *Radius.* 4, It's lower *Epiphyſis*, rugous, and ſeparated from it by a Suture. 5, The lower *Epiphyſis* of the *Cubitus*, ſeparated likewiſe by a Suture. 6, 6, 6, Three Bones of the firſt Rank of the *Carpus.* 7, 7, 7, Three Bones of the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ſecond Rank. 8——8, The Bones of the *Metacarpus.* 9——9, The firſt Bones of the Toes. 10——10, The ſecond Bones of the Toes. H, H, The *Oſſa Innominata* repreſented in *Profile.* I, The *Pelvis.* K, The Tail. L, L, The Two Thigh-Bones. 1, The *Epiphyſis* receiv'd by the *Oſſa Innominata,* and articulated with the *Femur* by a Suture. 2, The *Trochanter major.* 3, The lower *Epiphyſis.* 4. The *Patella.* M, The *Tibia.* 1, *Perone.* 2, The *Talus.* 3, The Bones of the *Tarſus.* 4, The Bones of the *Metatarſus.* 5, The Bones of the Toes.

Fig. 62, *Repreſents the* Fore-part *of the* Head.

Fig. 62.

a, The Hole for the Root of the Trunk. *b,* The lower Part of the *Os Palati,* over which hangs the *Proboſcis.* *c, c,* A Depreſſion of the Bone on each Side, for lodging of the Muſcles of the lower Jaw. *d, d,* The two Eminences on each Side at the top of the Head. *e,* A Depreſſion in the Middle betwixt theſe two Eminences. *f, f,* Two Beginnings of the Angles for forming the Depreſſions for the Muſcles of the lower Jaw, betwixt which the Surface of the Bone begins to be plain. *g,* The upper Production of the *Sinus* where the Eye is lodg'd. *h,* The Beginnings of the *Laminæ* which run betwixt the two Tables of the Skull, and here appear in the Bottom of the Hole for the Root of the *Proboſcis.* *i,* The *Os Vomeris,* to which the *Cartilaginous Septum* of the *Proboſcis* was adherent. *k,* The Beginning of the Depreſſion of the *Os Palati.* *l,* The Middle of the *Sinus* for the Orbit of the Eye. *m.* The Articulation of the two *Oſſa Palati.* *n, n,* The Articulation of the *Os Maxillæ* with the *Os Palati*; where alſo is a *Crena* for containing the Blood-Veſſels, as they go to the Nouriſhment of the *Proboſcis.* *o, o,* The Place where the Tuſks proceed from the *Os Palati.* *p. p.* The Upper-part of the Articulation of the *Os Maxillæ* with the *Os Palati.* *q, q,* The broken Extremities of the Tuſk. *r, r,* A great Oval Hole in the *Os Maxillæ,* thro' which a conſiderable Branch of the 5th Pair of Nerves, and a large Artery from the *Arteria duræ Matris* paſs to and are diſpers'd in the *Proboſcis,* and by which a big Vein returns and joins to the *Vena jugularis.* *s,* The *Os Zygomaticum.* *t,* The middle Production for the Orbit of the Eye.

Fig. 63. *Repreſents the* Side *of the* Head.

Fig. 63.

a, The Beginning of the Depreſſion for the Muſcles of the lower Jaw and *Proboſcis.* *b,* The Inſertion of the *Retractoris Proboſcidis.* *c,* The Inſertion of the *Muſculus Temporalis.* *d,* The Bottom of the Orbit of the Eye. *e,* It's upper Production. *f,* It's lower Production. *g,* The Articulation of the *Os Maxillæ* with the *Os Zygomaticum.* *h,* The *Os Zygomaticum.* *i.* The Articulation of the *Os Zygomaticum* with the *Os Calvariæ.* *k,* The Orifice of the *Meatus Auditorius.* *l,* One of the *Condyles* of the *Occiput,* which is articulated with the firſt *Vertebra.* *m,* The Orifice of the large Oval Hole in the *Os Maxillæ.* *n,* The fore Grinder of the upper Jaw. *o,* The hind Grinder or rather Wedge for keeping the fore Grinder faſt. *p,* The undulate Lines in the lower Surface of the Teeth. *q,* The Beginning of the Tuſks as they proceed from the *Os Palati*. *r*, Their broken off Extremities. *s*, The *Sinus* in the Bottom of the Orbit of the Eye for the *Nervus Opticus*.

Fig. 64. *Repreſents the* Back-part *of the* Head.

Fig. 64. *a*, *a*, The two Eminences at the Upper-part of the Head enlarg'd, whereby the *Sinus* betwixt them becomes narrower and deeper. *b*, The *Sinus* betwixt theſe Eminences ſhorten'd. *c*, *c*, The two *Condyles* which are receiv'd by the firſt *Vertebra*. *d*, The Hole for the Spinal Marrow. *e*, *e*, Two Protuberances above the *Meatus Auditorius*. *f*, The Orifice of the *Meatus Auditorius*. *g*, A *Sinus* whence the *Proceſſus Styloides* ariſes, *which is ſhewn by itſelf*. *h*, The Cartilages whereby the *Proceſſus Styloides* is articulated with the Skull. *i*, It's longeſt and ſmalleſt Part. *k*, It's ſhorteſt and biggeſt Part. *l*, The Orifice for the *hard Portion*. *m*, *m*, The Hole for the Jugular Vein and *Par Vagum*. *n*, *n*, The bony Part of the *Aqueduct*. *o*, *o*, The Extremity of the *Aqueduct* where the fleſhy Part begins. *p*, *p*, The Hole for the Carotid Artery. *q*, *q*, The Hole for the *Arteria Duræ Matris*, and 3d Branch of the 5th Pair. *r*, The middle of the Baſe of the Skull beneath the Hole for the Spinal Marrow, where the Bone is ſomewhat raiſed. *s*, A Depreſſion on the Baſe of the Skull before the *Choana* begins. *t*, The *Choana*, or Paſſage between the Root of the Trunk and the Mouth. *u*, A Production of the *Vomer*, or *Septum*, which divides the *Choana* in two. *x*, The Articulation of the *Os Zygomaticum* with the *Os Occipitale*. *y*, The *Glenoid* Cavity for Reception of the lower *Condylus* of the lower Jaw. *z*, The *Sinus* for the Globe of the Eye. 1, The *Os Zygomaticum*. 2, The Fore Grinder on the right Side. 3, The hind Grinder on the right Side. 4, The hind Teeth on the left Side, which not grinding at all, only ſerve as a Wedge. 5, The fore Teeth on the left Side, the back-part of which does not grind. 6, 6, The lower Surface of the Grinders, where their undulate Lines appear. 7, 7, Part of the *Os Maxillæ*, where it is articulated with the *Os Zygomaticum*. 8, 8, The great Oval Hole in the *Os Maxillæ*. 9, 9, The back-part of the *Os Palati*. 10, The Interſtice between the *Oſſa Palati* on the back-ſide. 11, 11, The Tuſks as they proceed from the *Os Palati*. 12, 12, The two broken off Extremities of the Tuſks.

Fig. 65. *Repreſents the* Skull *ſaw'd* tranſverſely, *ſo that it's* Lower-part *with the* Baſe *appear*.

Fig. 65. *a*, *a*, The outward Table of the Skull. *b*, *b*, The inner Table. *c*, *c*, The *Laminæ* which paſs betwixt the two Tables. *d*, *d*, The *Cells* form'd by theſe *Laminæ*. *e*, *e*, The Orifices for Veſſels which penetrate the *Laminæ*. *f*, The Seat of the Brain, repreſented more at Length in *Fig*. 64. *g*, *g*, The two *Condyles* which are receiv'd by the firſt *Vertebra*. *h*, The Hole for the Spinal Marrow. *i*, The *Os Zygomaticum*.

Fig. 66. Fig. 66. *Repreſents the* upper part *of the* Skull *ſaw'd* tranſverſely, *with the* Cells *running betwixt the* two Tables *and* Laminæ *which cover the* Seat *of the* Brain.

Fig. 67.

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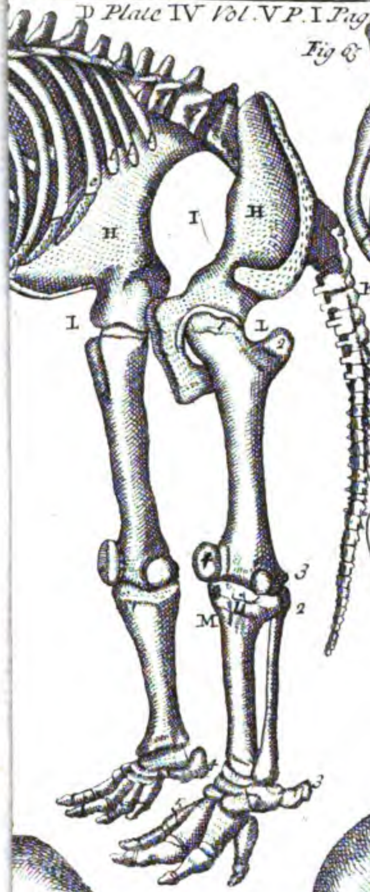

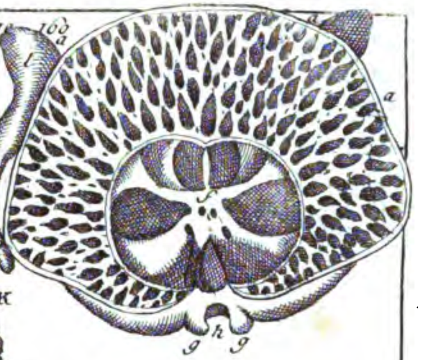
Fig 65

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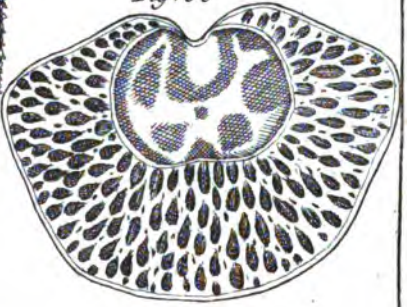

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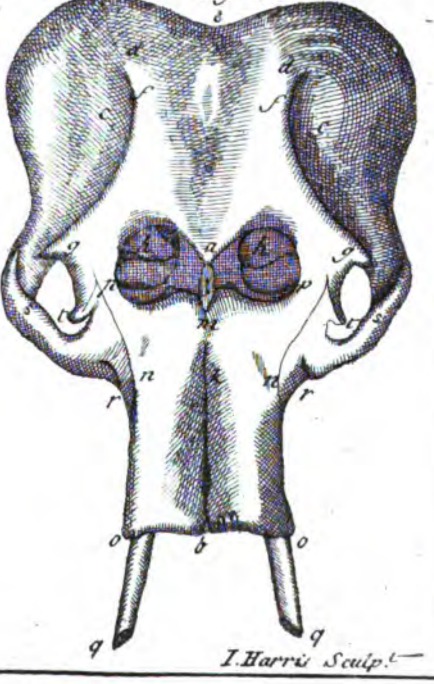

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Fig. 67. *Repreſents the* Outſide *of the* Upper-part *of the* Skull *ſaw'd* tranſverſely. Fig. 67.

a, a, Two Eminences on the Top of the Skull. *b,* A *Sinus* betwixt theſe two Eminences. *c,* A long *Spina* in the Bottom of the *Sinus.*

Fig. 68. *Repreſents the* Fore-part *of the* lower Jaw. Fig. 68.

a, a, The two *Condyles.* *b, b,* The two *Proceſſus Coronæ* ſhorten'd by the oppoſite View. *c, c,* The fore Grinders of the lower Jaw. *d,* The Diſtance between the two Jaws for lodging the Tongue. *e,* The *Symphyſis Menti.*

Fig. 69. *Repreſents the* Back-parts *of the* lower Jaw. Fig. 69.

a, a, Two *Condyles.* *b, b,* Two large Orifices of a Cavity, whereinto enter the Veſſels for nouriſhing the Teeth, and wherein are lodg'd the *Rudimenta Dentium,* as in *Fig.* 90. *c, c,* The two fore Grinders of the lower Jaw. *d, d,* The undulate Lines in their upper Surface. *e,* The Diſtance between them for lodging the Tongue. *f,* The concave Part of the lower Jaw.

Fig. 70. *Repreſents one* Side *of the* lower Jaw. Fig. 70.

a, a, The two *Condyles.* *b, b,* The two *Proceſſus Coronæ.* *c,* A protuberant Part of the lower Jaw, where the *Rudimenta Dentium* are lodg'd. *d,* The inner Grinder of the lower Jaw. *e,* The outward Grinder, where are repreſented the Ridges and Interſtices of the Sides of the Teeth. *h,* The *Symphyſis Menti.*

Fig. 71. *Repreſents the bony Part of the* Meatus Auditorius *of the Right Ear.* Fig. 71.

a, The external Orifice of the *Meatus Auditorius.* *b,* The *Proceſſus Petroſus.* *c,* The Orifice where the *Nervus Auditorius* enters. *d,* The *Meatus Auditorius.* *e,* A Part of the *Laminæ,* which proceed from it on each Side, by which the *Cellules* betwixt the two Tables of the Skull are form'd; thoſe ſituated above the *Meatus* being remov'd. *f.* Part of the inner Table of the Skull.

Fig. 72. *Repreſents Part of the* Meatus Auditorius *open'd, with other Parts of the* inner Ear. Fig. 72.

a, The ragged Part of the Bone, from whence the *Os Petroſum* was ſeparated. *b,* The *Proceſſus Petroſus* open'd. *c,* The *Crena* for the *Membrana Tympani.* *d,* The Honey-comb Cavity of the *Tympanum.* *e.* It's inner Cavity of a ſmooth Surface. *f.* It's *ſemi-circular* or undulated Lines. *g,* The Orifice of the *Aqueduct.* *h,* The Orifice of the hard Portion of the *Nerve.*

Fig. 73. *Repreſents the lower Surface of the* Os Petroſum, *as it was ſeparated from above the* Tympanum, *and other Parts of the inner* Ear. Fig. 73.

a, a, The ragged Margin of the Bone. *b, b,* The upper Part of the *Cavitas Tympani.* *c,* The *Foramen Ovale.* *d,* The Protuberance in which the *Labyrinth* and *Cochlea* are lodg'd. *e,* The Orifice of the hard Portion of the *Nervus Auditorius.*

Fig. 74. *Repreſents the* Malleolus *alone in it's true Dimenſions.* Fig. 74.

1, The protuberant Head. 2, The ſemi-circular *Sinus* betwixt it and the Margin. 3, The *Sinus* which receives the Head of the *Incus.* 4, The Angle below the *Sinus,* for the Head of the *Incus.* 5, The Angle where the *Manubrium Malleoli* begins. 6, The *Manubrium Malleoli.*

Fig. 75. Fig. 75. *Repreſents the* Incus.

1, The Head of the *Incus.* 2, The *Sinus* or Neck of the *Incus.* 3, Two *Apophyſes.* 4, A long Protuberance with the *Sinus* for the *Os Quadrangulare* at it's Extremity.

Fig. 76. Fig. 76, 77, 78, *Repreſent the* Stapes.

1, The ſmall Part of the *Stapes,* where it is articulated with the *Incus,* with a *Sinus* at it's Extremity, being the other Half of the Cavity for the *Os Quadrangulare.* 2, 2, Two ſmall Portions of the *Stapes,* where it is articulated with the *Baſis.*

Fig. 77. Fig. 77. *The* Baſis *of the* Stapes *ſeparated.*

Fig. 78. Fig. 78. *The whole* Stapes.

Fig. 79. Fig. 79. *The* Malleolus *and* Incus *join'd together, with their lower Side turn'd up.*

1, The *Malleolus.* 2, It's Articulation with the *Incus.* 3, The *Incus.* 4, The *Manubrium Malleoli.* 5, A Point of the *Incus,* fram'd by the other two Productions. 6, The long Protuberance of the *Incus.* 7, The *Sinus* in the Extremity of it's long Production.

Fig. 80. Fig. 80. *The* Malleolus, Incus, *and* Stapes *articulated together.*

1, The *Incus.* 2, The *Malleolus.* 3, The *Stapes* where it ſhuts the *Foramen Ovale.*

Fig. 81. Fig. 81. *Repreſents the Upper-part of the* Lineæ Semilunares, *or that Side which is towards the Paſſage of the* Nervus Auditorius.

a, The five Extremities cut off. *b,* The *Linea Semilunaris Major.* *c,* The *Semilunaris Media.* *d,* The *Minor.* *e,* The common Canule between the *Major* and *Media.*

Fig. 82. Fig. 82. *Repreſents the* Cochlea *and* Labyrinth *together.*

a, The *Veſtibulum.* *b,* The *Foramen Ovale.* *c,* The *Foramen Oblongum.* *d,* The *Linea Semilunaris Minor,* which is towards the *Cavitas Tympani.* *e,* The common Canule to the *Major* and *Media.* *f,* The *Major.* *g,* The *Media.* *h,* The *Cochlea.*

Fig. 83. Fig. 83. *Repreſents the* Cochlea.

Fig. 84. Fig. 84. The *Veſtibulum.*

b, The third *Gyre* or Turning. *c,* The Orifice. *d,* The firſt *Gyre* or Turning opened. *e,* The ſecond Turning. *g,* The Orifice at the Top of the *Cochlea.*

Fig 85. Fig. 85. *Repreſents the* Seat *of the* Brain enlarg'd, *that the* Orifices *for the* Blood-Veſſels *and* Nerves *may be the more obvious.*

a, a, The inner Table deprived of the ſurrounding *Cellules.* *b, b,* The anterior *Sinus.* *c, c,* The *Os Ethmoides,* with it's Eminences, *Sulci,* and *Foramina* for the *Nervus Olfactorius.* *d,* The *Criſta Galli.* *e, e,* The anterior Eminences. *f, f,* The Orifice for the *Nervus Opticus.* *g, g,* The

Hole called the *Foremen Lacerum*, through which paſs the *Nervi Motorii Pathetici Ophthalmici*, or firſt Branch of the 5th and the 6th Pair. *h*, *h*, The ſecond Branch of the 5th Pair. *i*, *i*, The third Branch of the 5th Pair. *k*, *k*, The Hole for the *Arteria duræ Matris*. *l*, *l*, The Hole for the Carotid Artery. *m*, *m*. The Hole for the *Nervus Auditorius*. *n*, *n*, The Hole for the Jugular Vein. *o*, The Hole for the Spinal Marrow. *p*, *p*, Part of the two *Condyles*. *q*, The External Hole for the Spinal Marrow. *r*, *r*, The two middle *Foſſæ*. *s*, *s*, The *Proceſſus Petroſus*. *t*, *t*, The *poſterior Foſſa*, or Seat of the *Cerebellum*. *u*, The The Seat of the *Glandula Pituitaria*. *x*, The *Crena*.

Fig. 86. Fig. 86. *Repreſents the* Uterus.

a, *a*, Part of the *Ligamenta Lata Uteri*. *b*, Part of the *Vagina* cut off. *c*, The Beginning of the Body of the *Uterus*. *d*, Divided into two Portions, with an Interſtice in the Middle. *e*, *e*, Several Eminences repreſenting the external Part of ſo many *Cellules*. *f*, *f*, The *Cornua Uteri*. *g*, A looſe Membrane wrapt up, that the *Ovaria* below may appear. *h*, The *Ovarium* depriv'd of the thick looſe Membrane which fluctuates above it. *c*, The *Ovarium* cover'd with the Membrance.

Fig. 87. Fig. 87. *Repreſents the* Proboſcis *cut tranſverſely*.

a, *a*, The two Cavities of the *Proboſcis*. *b*, The *Septum* which divides the Cavities. *c*, *c*, The tendinous Interſection which runs from before to behind. *d*, *d*, The tendinous Interſection which runs from the Right to the Left. *e*, *e*, *e*, *e*, The Inſertion of the four Muſcles into the tendinous Interſection, whereby the Fibres of the one aſcend, and the other deſcend obliquely.

Fig. 88. Fig. 88. *Repreſents the diſſected* Proboſcis.

a, The external Part of the Cartilage which ſurrounds the Cavity of the *Proboſcis*, as it ariſes from the Hole in the Fore-part of the Skull. *b*, *b*, That Pair of Muſcles call'd the *Levatores Proboſcidis*, rais'd from above the foreſaid Cartilages, with their inner Surface turn'd up, that the Divarications of the Blood-Veſſels in them may appear. *c*, *c*, The Orifices of the Veins diſpers'd in theſe Muſcles. *d*, *d*, The Orifices of the Arteries. *e*, *e*, Their ſeveral Branchings. *f*, The Deſcent ſtraight along above the Cavity of the *Proboſcis*. *g*, *g*, The oblique Deſcent of the Fibres of the *Erectores* of the *Proboſcis*. *h*, The tendinous Interſection running down the Middle of the *Proboſcis*. *i*, *i*, The Orifices of the Cavities of the *Proboſcis*.

Fig. 89. Fig. 89. *Repreſents the Extremity of the* Proboſcis *cut off*.

a, A Protuberance ariſing from the Fore-part of the Extremity of the *Proboſcis*, and is extended into a Cavity in the Back-part *b*, whereby the Animal catches hold of any thing.

Fig. 90. Fig. 90. *Repreſents one of the Rudiments of the Teeth, which was taken out of the great Hole in the inner Side of the lower Jaw, as repreſented (b,* Fig. 69.*), but much enlarg'd in the Proportion.*

a, It's upper Part, which is hard, ſolid, and white. *b*, It's middle Part diſtinguiſh'd by ſeveral Furrows and Ridges. *c*, It's lower Part, which is hollow, and whereinto both the Blood-Veſſels that ſerve for it's Nouriſhment, and a Branch of the Nerve call'd *Maxillaris Inferior*, proceeding from the fifth Pair, enters.

Fig. 91. Fig. 91. *Repreſents a Portion of the* Cuticula, *wherein is ſhewn it's inner Surface, and uſual Thickneſs; at it's Margin at the Left Hand, and lower Part, are ſeveral white Lines, which I take to be the Lineaments of ſo many Blood-Veſſels; the Pyramids, from whence the Hairs proceed, with the ſeveral* Favi *or Depreſſions.*

Fig. 92. Fig. 92. *Repreſents one of the Scabs adhering to the* Cuticula, *where they are thickeſt.*

Fig. 93. Fig. 93. *The firſt* Vertebra *of the* Neck *with it's upper Part in* Profile, *to ſhew the* Holes *for the* Arteria Vertebralis.

a, *a*, Two Protuberances, which reach on each Side to the Skull. *b*, *b*, Two Cavities fore-ſhorten'd, which receive the *Condyles* of the Skull. *c*, *c*, The two Holes whereby the *Arteria Vertebralis* proceeds from the Skull, and perforates this *Vertebra*. *d*, *d*, Two Holes through which the Artery paſſes out from this *Vertebra*. *e*, *e*, A *Crena* betwixt the two aforeſaid Holes, where the Artery is lodg'd.

Fig. 94. Fig. 94. *The Fore-part of the* firſt Vertebra *ſhewn at large*. *a*, The Hole for the Spinal Marrow. *b*, The Hole for receiving the Tooth of the following *Vertebra*. *c*, *c*, Two Cavities for receiving rhe *Condyles* of the Skull. *d*, *d*, Two Holes for the Cervical Artery. *e*, The upper Part of the *Vertebra*. *f*, It's lower Part. *g*, *g*, The tranſverſe Proceſſes, whoſe Protuberances at the Extremities are repreſented, *a*, *a*.

Fig. 95. Fig. 95. *The Back-part of the* firſt Vertebra *ſhewn at large*.

a, The Hole for the Spinal Marrow. *b*, The Hole for the Tooth of the following *Vertebra*. *c*, *c*, The Cavities which receive the Body of the following *Vertebra*. *d*, The lower Part of the *Vertebra*. *e*, *e*, The Holes for the Cervical Artery. *f*, *f*, The two tranſverſe Proceſſes.

Fig. 96. Fig. 96. *The Fore-part of the* ſecond Vertebra.

a, *a*, The forked Extremities of the Protuberance, which ariſes inſtead of the *Proceſſus Spinoſus*. *b*, A *Sinus* betwixt them. *c*, The Hole for the Spinal Marrow. *d*, The Tooth which is receiv'd by the firſt *Vertebra*. *e*, *e*, The two convex Surfaces which are receiv'd into the hind Cavities of the firſt *Vertebra*. *f*, *f*, The two Holes for the Cervical Artery. *g*, *g*, Two tranſverſe Proceſſes. *h*, The lower Part of the *Vertebra*.

Fig. 97. Fig. 97. *The Back-part of the ſame* Vertebra.

a, *a*, The Protuberances of the *Proceſſus Spinoſus*. *b*, The *Sinus* betwixt them enlarg'd on the Side. *c*, The Hole for the Spinal Marrow. *d*, The Point of the Tooth appearing from the other Side. *e*, *e*, The Holes for the Cervical Artery. *f*, The concave Body of the *Vertebra*, which receives the convex Surface of the following *Vertebra*,

Plate V. Vol.V. Part I. Page. 164.

Fig. 79.

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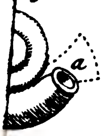

Fig 73

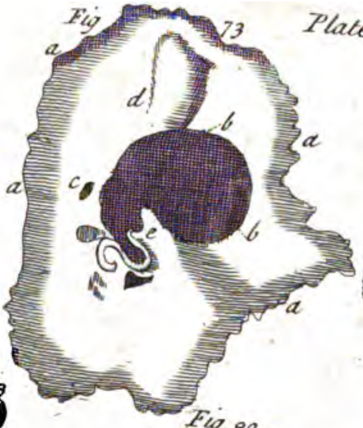

Fig. 67

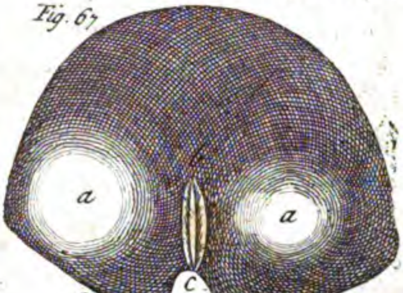

Fig. 80

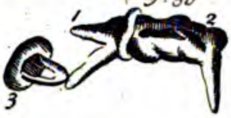

Fig. 68

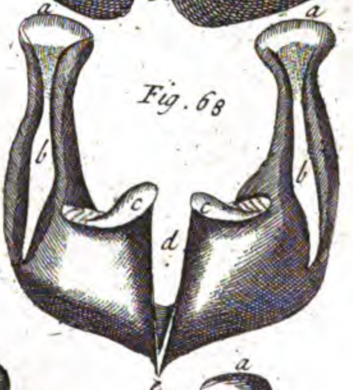

Fig. 84

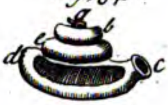

Fig. 85

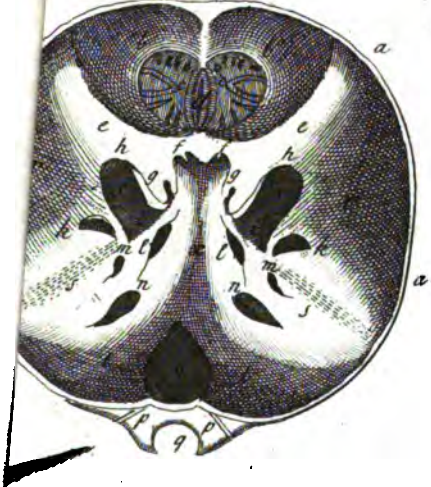

Fig. 69

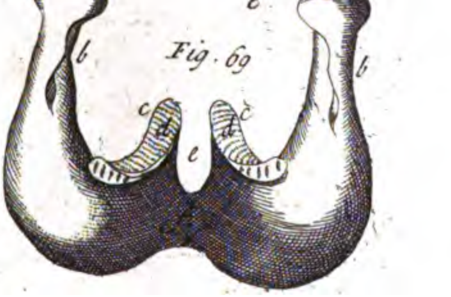

Fig. 70.

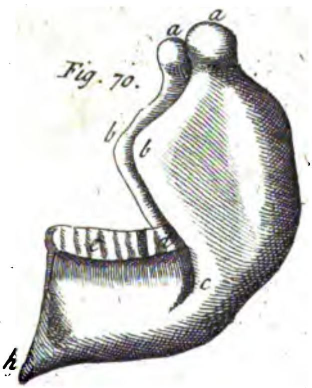

Fig. 87

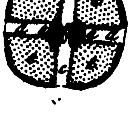

Fig. 89

Vertebra. *g, g,* The *tranſverſe Proceſſes.* *h, h,* The two oblique Proceſſes which receive the oblique Proceſſes of the following *Vertebra.*

Fig. 98, 99, 100, 101, 102, 103, 104, 105, 106, 107. Note, *That the five following* Vertebræ *are repreſented by* A, B, Fig. 98, 99, 100, 101, &c. *whereof* A, *repreſents the Fore-part.* B, *the Back-part*; *all the reſt of the ſmall Letters ſhewing as follows.* Fig. 98, 99, 100, 101, 102, 103, 104, 105, 106, 107.

a, a, &c. The Hole for the Spinal Marrow. *b, b, &c.* Their convex Bodies, which are received by the concave Surfaces of the following. *c, c, &c.* Their concave Bodies, which receive the convex Surfaces of the former. *d, d, &c.* The Holes for the Cervical Artery. *e, e, &c.* The oblique Proceſſes. *f, f, &c.* The tranſverſe Proceſſes. *g, g, &c.* The Spinal Proceſſes, which in the Fore-part of the 3d and and 4th *Vertebra* (*Fig* 98, 100.) ſcarcely appear, but in their Back-part (*Fig.* 99, 101.) appear a little, in the 5th (*Fig.* 102, 103.) ariſe to 1 ½ Inch, and in the 6th (*Fig.* 104, 105.) to 3 Inches. *h, h,* In the 6th and 7th (*Fig.* 104, 105, 106, 107.) are Protuberances, which run back to guard the Cervical Artery as it paſſes from between the Bodies of the *Vertebræ,* and quits the Perforation in their tranſverſe Proceſſes. *i, i,* Two *Sinus*'s in the Back-part of the ſeventh *Vertebra,* which with the like Surfaces in the following make up a Cavity whereinto the *Condyles* of the firſt Ribs are received.

Fig. 108. *Repreſents the* Scapula. Fig. 108.

a, The Head of the *Scapula,* whereby it is articulated with the *Humerus.* *b, b,* The two Protuberances on each Side of it's Head. *c,* The Neck of the *Scapula.* *d,* A *Sinus* between the *Proceſſus Coracoides,* and the Neck of the *Scapula.* *e,* The *Proceſſus Coracoides,* of the *Scapula.* *f,* The *Proceſſus Spinoſus.* *g,* The Extremity of the *Proceſſus Spinoſus.* *h,* A Protuberance running forward from the *Proceſſus Spinoſus.* *i,* The Fore-part of the upper Edge of the *Scapula.* *l,* A thick ſpongy *Epiphyſis,* which (at the upper Edge of the *Scapula*) was ſeparated by Boiling. *m,* The Angle at the Back-part of the *Scapula.*

Fig. 109. *Repreſents the lower or Fore-part of the ſeven* Vertebræ *of the* Neck. Fig. 109.

a, b, c, &c. The lower or Fore-part of the Bodies of all the *Vertebræ.* *h, h,* The tranſverſe Proceſſes, which run obliquely forward. *i, i,* The tranſverſe Proceſſes of the 6th *Vertebra,* running both before and behind to guard the *Arteria Cervicalis.* *k,* A Sinus in the Body of the ſeventh *Vertebra,* for receiving a Part of the firſt Rib.

Fig. 110. *Repreſents the Fore-part of the* Oſſa Innominata. Fig. 110.

	Feet.	Inches.
A, The *Pelvis* in Circumference	4	6
B, The *Os Sacrum*		
C, The upper Part of the *Os Pubis*		
B, C, Between the *Os Sacrum* and the *Os Pubis*	1	6
D, E, From the Right to the Left of the *Pelvis*	1	5

C, F,

	Feet.	Inches.
C, F, From the upper to the lower Part of the *Os Ilium*	1	
G, H, Betwixt the two outward Extremities of the *Oſſa Innominata*	3	6
B, H, From the *Os Sacrum* above to the foreſaid Point	2	9½
From H to K	1	
L, The Circumference of the *Acetabulum*	1	6
E, H, Breadth of the *Os Ilium*	1	1
M, M, Circumference of the Neck of the *Ilium*	1	2
N, N, Breadth of the *Os Pubis*		8
O, O, The Length of the *Foramen Ovale* for the *Muſculus Marſupialis.*		5½
P, P, It's Breadth		4
Q, Q, It's Circumference	1	1
R, R, The Breadth of the *Oſſa Pubis* before	1	5
S, T, The Length of the *Os Sacrum*, from where 'tis join'd with the *Vertebræ Lumborum*, to where 'tis join'd with the Tail.		

Fig. 111. Fig. 111. *Repreſents the Back-part of the* Oſſa Innominata.

A, The *Pelvis*. B, The Back-part of the *Oſſa Pubis* at their Articulation, where there is a large Cavity. C, C, The oval Hole for the *Muſculus Marſupialis* fore-ſhorten'd. D, The Cavity for the *Acetabulum*. E, E, The Margin of the *Os Ilium*, which was ſeparated by Boiling. F, The Back-part of the *Oſſa Innominata*, ſhewing their ſpinal and oblique Proceſſes.

Fig. 112. Fig. 112. *Repreſents the Back-part of the* Fore-Foot.

a, *a*, The Bones of the *Carpus*, *b*, *b*, The Bones of the *Metacarpus*. *c*, *c*, The *Oſſa Seſamoidea*, whereof there are two upon the lower Extremity of each Bone of the *Metacarpus*. *d*, *d*, The Bones of the Toes.

Fig. 113. Fig. 113. *Repreſents the Back-part of the* Hind-Foot.

a, The *Talus*. *b*. Part of the *Aſtragalus*. *c*, *c*, Bones of the *Tarſus*. *d*, *d*, Bones of the *Metatarſus*. *e*, *e*, Bones of the Toes.

Fig. 114. Fig. 114. *Repreſents the Bones of the* Carpus *ſeparately*.

1, The upper Surface of the external Bone of the firſt Rank of the *Carpus*. 2, The middle Bone. 3, The third Bone of the firſt Rank. 5, 6, The upper Surface of the three Bones of the ſecond Rank.

Fig. 115. Fig. 115. *Repreſents the Bones of the* Tarſus *ſeparately*.

1, The upper Surface of the *Aſtragalus*. 2, The upper Surface of the *Os Naviculare*, much enlarg'd in Proportion to the reſt. 3, It's lower Surface. 4, 5, 6, The upper Surface of the *Oſſa Cuneiformia*.

Fig. 116. Fig. 116. *Repreſents the concave Side of the Liver.*

a, The *Vena Porta*. *b*, The *Vena Cava*.

Fig. 117, 118. Fig. 117, 118. *Repreſent the* Os Hyoides.

a, The Fore-part.

Fig. 116.

Fig. 118. *b*, The Back-part. *d*, *d*, The *Cartilago Scutiformis*. *e*, *e*, The lateral *Oſſa Hyoidea*. *f*, *f*, The Bones of the Baſe of the *Os Hyoides*.

On the Parts *of* Generation *in a* Female Elephant, *And* Microſcopical *Obſervations on the* Skin. *By* Mr Leeuenhoek, *n.* 363. *p.* 518.

XXIV. Some Years ago an Elephant was a ſhewn about at the *Hague*, the biggeſt that ever I ſaw. Caſting my Eyes upon the hinder Part of her, in order to obſerve the *Matrix*, I could not diſcover the leaſt Appearance thereof; whilſt I was curiouſly viewing this great unweildy Creature, ſhe made Water; but not like our four-footed Creatures, from whom their Water iſſues, as it were, in a Stream; for from this Creature it burſt out all at one, juſt as if any Liquor were poured out of a Can, Top and Bottom all together: And I obſerv'd, that the Skin, out of which the Water flowed, was extended, or thruſt outwards about the Space of three Fingers Breadth; and the Orifice, or Opening of the Skin in that Place, ſeem'd to be ſo large, that one might thruſt one's Fiſt into it: And that Part from whence the Water was diſcharg'd, was not ſituated, as it uſually is in our fourfooted Beaſts, under the Tail, but in the Belly, and very near that Part where the Navel grows in our Creatures.

This appear'd to me to be a very particular Diſcovery; the more, becauſe I remember'd I had often read, that when the Time came for the Copulation of Elephants, the Female Elephant uſed to prepare herſelf a Bed with the Boughs of Trees, and then caſt herſelf upon her Back on them; but none of the Authors that I had read gave their Reaſons for her doing ſo.

Caſting my Eyes upon the fore Legs of the Elephant, I obſerv'd growing upon the upper Part of the Body, or about the Breaſt, two Nipples, which in Cows we call Dugs, quite contrary to thoſe of Mares, Cows, *&c.* whoſe Dugs are placed near the hinder Legs. But when we conſider farther of the Matter, we muſt conclude, that Nature has ſo order'd it, in relation to the Elephant, for the Benefit of her young ones, which ſhe could not have ſuckled, if her Dugs had been placed between her hinder Legs; for by reaſon of the Poſition of the Mouth under the Trunk, the young Elephant can't ſuck it's Dam; but the old one ſucks at her own Breaſt, and by the Help of her Trunk conveys the Milk into the Mouth of the young one.

On the Skin.

After this, I viewed the Skin of the Elephant, which was very rough; upon which, diſcourſing with the Keeper, I was told that that Roughneſs fell off every Year; and at my Requeſt he ſcraped off a little of the ſaid Skin upon a Paper.

I always imagined that the moſt Part of it was a protruded Matter, which had not Nouriſhment enough to turn it all into Hair; and that what became Hair was very ſhort and thin in proportion to the Bigneſs of ſo great a Body; and the Hair which is upon the Tail of the Elephant, is much thicker than that which is upon the other Parts of the Body. But as I more nicely view'd the ſcrap'd off Particles of the Skin, I diſcover'd in ſome of the Particles ſhort ſmall Hairs, the Roots of which were ſticking outwards in that Part which is joined to the Skin.

Fig. 119. The Particles that were ſcrap'd off from the Skin of the Elephant, were crumbled into as ſmall Pieces as are deſcrib'd by *Figure* 119. A, B, C, D, E. A was a Particle on which there had been two Hairs, but by the Microſcope one might diſcover four.

When theſe Particles were ſcrap'd off from the Skin, ſome of 'em were thick, and as it were united to each other; but they were eaſily divided into ſuch Particles as are deſcrib'd by the aforeſaid *Fig.* 119.

This yearly ſhedding of Matter that is upon the Skin may be thus accounted for: When the Time comes that there is no Increaſe of the Hair, but that it is, as it were, at a Stand, as we ſee in other Creatures that ſhed their Hair, the ſame Thing happens to the Elephant; the Hair of which, as thin as it is, for the moſt Part falls off, and the incruſted Particles which ſtick to the Skin muſt alſo fall: And thoſe Particles lay as cloſe to one another, as if they were united, being ſurrounded with flattiſh Sides in the Manner they are ſhewn by *Figure* C, upon which there was remaining a ſmall Particle of Hair or Wool.

Fig. 119. Having nicely view'd one of thoſe Particles that are deſcrib'd by *Figure* 119. I diſcover'd on that Side which was next to the Skin ſeveral little Holes, in ſome of 'em 8, 10, 15, or more, according to the Bigneſs of the Particle; but when I view'd the ſame on that Side which was fartheſt from the Body, the ſaid Holes were cloſed: And I obſerv'd in ſome few of thoſe Particles ſmall Hairs ſtanding out, which run into an exceeding ſlender Point, agreeing with the Hairs of other Creatures, which are rubbed or cut off.

That I might the better diſcover the Figures of the ſaid Matter, I ſlit ſome of the Particles (ſteep'd a little in boiling Water) with a ſharp Penknife: I found nothing, only in ſuch a Particle I met with 25 ſmall Sands.

I took a Slice of one of the Particles deſcrib'd *Fig.* 119. and which (as I ſaid before) had a great many Cavities or Holes in it; and placing Fig. 120. the ſame before a Microſcope, caus'd it to be drawn, as in *Fig.* 120. F, G, H, I, and ſo it appear'd to the Painter tho' in my Eye it was larger: But I will not determine whether theſe little Holes were fill'd with Hairs when they were united to the Body, nor whether thoſe Hairs ſtuck faſt in the Skin, as to remain there upon the Separation of the aforeſaid Particles.

Fig. 121. I cut off a Slice from another Particle, and caus'd it to be drawn, as in *Fig.* 121. K, L, M, N. This Particle appear'd very wonderful to me, conſiſting of 10 Circles; each of which I fancied was produc'd at a different Time, and perhaps in a Month, according as the Matter was protruded from the Skin. When I cut a Slice out of the Middle of one of thoſe Particles, deſcrib'd *Fig.* 119. I could ſee no

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Fig. 116

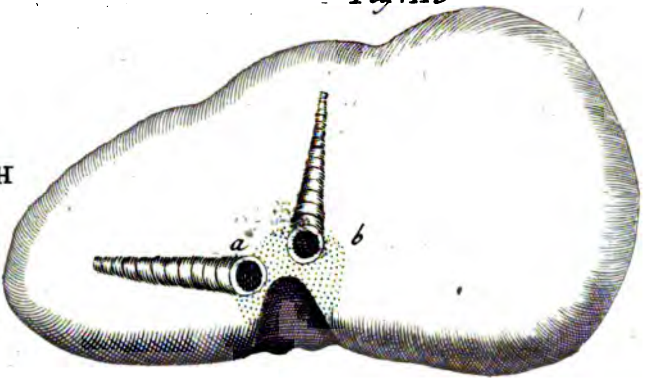


Fig. 121

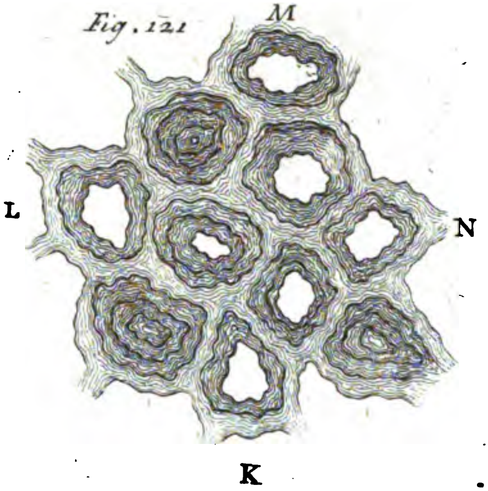
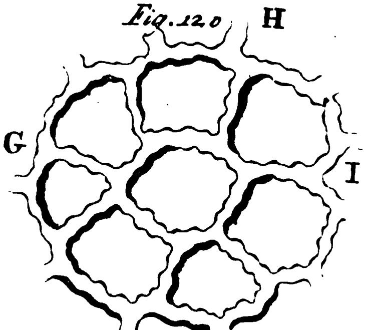


Fig. 120



Holes in it; neither could I, when I cut off any of the upper Part, diſcover the leaſt Appearances that are deſcrib'd, *Fig.* 121. which was occaſion'd perhaps by the Elephant's rubbing or lying upon thoſe Parts.

The Parts of Generation *in a* Male Opoſſum. *By* Mr W. Cowper, *n.*290.*p.*1576.

XXV. This *Male Opoſſum* was brought from *Virginia*, but falling from it's Meat, it languiſh'd and dy'd: The Cauſe of it's Death appear'd to be from a Mortification of the *Duodenum*, immediately below the *Pylorus*, which ſeem'd to ariſe from a Quantity of Hay that had been collected in the Stomach, and matted together in the Shape Dr *Tyſon* deſcrib'd, and figur'd the * hairy *Tophus* he found in the Stomach of that he diſſected, but I could not find any Hair in this: This Wad of Hay ſlipping out of the Stomach, ſtuck in the *Duodenum*, which, together with the viſcid Matter that involv'd it, compleatly obſtructed the Paſſage in that Gut, as well as that of the Gall into the Gut, which appear'd from the Diſtenſion of the Liver, as well as Fulneſs of the Gall-Bladder. The *Omentum*, which in this Creature is only faſtned to the bottom of the Stomach, had alſo ſuffered a *Gangreene*, as had almoſt the whole Canal of the Guts.

Beſides the Organs imploy'd in Generation, the *Male Opoſſum* differs externally from the *Female*, there being no *Marſupium* or Pouch to receive the Young Ones, which Dr *Tyſon* has given ſo exact a Deſcription of; nor are there any Muſcles inſerted to the Skin of the *Abdomen* ſpringing from the *Oſſa Marſupialia*, as he calls the Bones, which may deſerve the Name of *Hyoides*, from the Figure they make with the *Oſſa Pubis* of this Animal; which Bones do not ſeem to differ in the *Male*, from thoſe of the *Female* that Dr *Tyſon* deſcrib'd.

Fig. 122.

Fig. 122.

There is no external Appearance of Genitals in the *Male Opoſſum* but the *Scrotum*, which is but juſt big enough to contain the *Teſtes*; nor could I readily diſcover any other *Foramen* outwardly in theſe Parts but the *Anus* A, which leads to the *Rectum*; but on withdrawing it's Sides, I found another *Foramen* B, which, on Diſſection, appear'd to be the *Præputium* or Out-let of the *Penis*. On compreſſing the Parts on each Side this *Cloaca* A B, I obſerv'd two Drops of yellowiſh colour'd Liquor (of the Reſemblance of *Pus*) ſtart out on each Side the *Anus c c*, which on further Examination I found came from two glandulous Bodies or Bags plac'd on the *Sphincter Muſcle* of this Part. This Sort of Liquor Dr *Tyſon* found in the Pouch of the *Female*, which, like this, had more of the peculiar *Fœtor* of this Animal, than any other Part beſides; for on removing theſe Parts with the Skin about the *Cloaca*, I was freed from the ungrateful Smell of it. On ſeparating the Skin from the Muſcles of the *Abdomen*, the two above-mentioned Bones (peculiar, I believe, to this Animal) appear'd, from whence ſome Muſcles ſprang, and were inſerted to the *Oſſa Femorum*, which perform'd the Office of the *Pſoas*

* *Vide* Supra, V. II. C. VI. S. CIX.

Muſcles in other Animals, which laſt-named Muſcles were much ſmaller in this than in other Creatures.

The *Abdominal Muſcles* were alſo faſten'd to the laſt-mention'd Bones, particularly the *Recti*, which enabled this Creature to project or ſpring it's Body, eſpecially in pulling it's hind Legs forward, with more Advantage or Force than other Animals, which are without theſe Bones.

Immediately under the Skin, about the *Cloaca*, I found a thin fleſhy Muſcle, incloſing the *Præputium*, and lower Parts of the *Rectum* and *Odoriferous Bags*, together with the four *Mucous Glands* M M, Fig. 123,124. N N, at the Roof of the *Penis*, and Body of the *Penis* itſelf A; all which Parts were liable to be compreſs'd by the Action of this Muſcle, eſpecially when the *Penis* is erected, whereby it's Erection is ſuſtain'd, by compreſſing the two external Veins on the *Dorſum Penis*, of which more hereafter, when I come to ſpeak of the Manner the *Penis* of this Animal is erected. On removing this thin broad *Sphincter Muſcle*, I was obliged to clear away two Lumps of hard Fat before the Body of the *Penis* could be diſcover'd; but we ſhall leave theſe Parts till we have clear'd the *Teſtes*.

The *Scrotum* being remov'd, each Teſticle appear'd as repreſented Fig. 123,124. on the Left Side Q T V, the *Vaſa Præparantia* and *Deferentia* Q Q, being inclos'd in the *Cremaſter* Muſcles P P. Theſe Muſcles were proportionably very large in this Animal, as I have always obſerv'd them in Creatures that have no *Veſiculæ Seminales*, which is the Caſe of this Animal, and this Proviſion of Nature ſeems not only neceſſary to ſuſpend the *Teſtes*, but theſe incloſed *Cremaſter* Muſcles alſo compreſs the *Epididymides* and *Vaſa Deferentia*, and oblige them to diſpatch their Contents (the *Semen*) into the *Urethra* in the time of *Coition*, which otherwiſe would have a ſlow Progreſs: But this Contrivance appears more peculiarly requiſite in this Creature, becauſe the Defect of the *Veſiculæ Seminales* here ſeems to be ſupplied by the Largeneſs of Fig. 123, 124. the *Epididymides* of the *Teſtes* W W, which are the Excretory Ducts of the *Teſtes*, and appear in this Animal to have a larger Bore than ordinary: For this Reaſon the *Tunicæ Vaginales* are very ſtreight in Fig. 123. this Animal, as appears in the Figure T V R R,

On diſcovering the Originations of the Spermatick Arteries, I was ſurpriz'd to meet with an Appearance I never heard of nor obſerv'd before; and in this I ſhould not have had any Satisfaction, if I had not firſt injected Wax into the Trunks of the great *Artery* i i i, and *Vena Cava* b, below the *Diaphragm*. It ſeems the deſcending Trunk of the great Artery, below the emulgent Arteries in the Creature, is plac'd directly under the Trunk of the *Vena Cava*; nor does the Iliack Branches of the Arteries here, twine about thoſe of the Veins, as in Human Bodies, and ſome Quadrupeds, which is done, perhaps, to compreſs the Channels of the Veins, by means of the Pulſation of theſe Arteries, to drive up the Blood in the Veins towards the

Heart; but that Contrivance ſeems no Way neceſſary in this Animal, becauſe the contrary Poſition of it's Body is more cuſtomary in hanging by it's Tail, with it's Head downwards: It is not unlikely, if the Veins of this Animal were examin'd below the Heart, which indeed I did not think of till thoſe Parts were thrown away, but we ſhould meet with ſome Contrivance to prevent the precipitate Flux of the Blood in that pendulous Poſition, as I have obſerv'd in the Trunk of the *Cava*, immediately above the Liver in Dogs: But to return to the Spermatick Veſſels;

The Arteries *a a* ariſe from the fore-part of the deſcending Trunk Fig. 123. of the great Artery, and paſs thro' a very ſmall Perforation *———— made on Purpoſe in the *Vena Cava*, and deſcend ſtraight to the *Teſtes*, as in Human Bodies, and are not contorted in their Progreſs, as we find them in moſt, if not all, Quadrupeds. This Perforation of the *Cava*, perhaps, was not only made for tranſmitting the Spermatick Arteries, but may alſo frame an *Annulus*, that may check the Velocity the Blood would otherwiſe have in thoſe Arteries, which rapid Motion of the Blood, we find Nature ſtudiouſly avoids in the *Teſtes* of all Animals: For in Men we ſee theſe Spermatick Arteries (contrary to all other Trunks of Arteries) are leſs at the Originations from the great Artery; and in Quadrupeds (except in this) the Spermatick Arteries are contorted before they reach the *Teſtes*, as I have † elſewhere taken Notice. † *Vid* Infra. C. VI. §. iii. The Spermatick Veins, after leaving the *Teſtes* of this Animal, (like thoſe of Human Bodies) have ſeveral Diviſions and Inoſculations, which are all reduc'd to one Trunk on each Side, and empty themſelves into the *Cava*, immediately above the Perforation *b b*. Fig. 123.

Had the known Structure of the *Teſtes*, in Relation to their Excretory Ducts, been left undiſcover'd 'till now, the bare Inſpection of thoſe Parts in this Animal would inſtruct us; for on dividing the *Tunica Vaginalis* (R R), I found the incloſed Teſticle and it's *Epididymis* Fig. 123,124. lying looſe, inſomuch that they parted from each other as expreſs'd W, X, Y, Z, and with the Aſſiſtance of a pretty large Convex Glaſs, I could ſee the *Excretory Duct* Z ariſing from one End of the Teſticle, where the Spermatick Artery and Vein Y may be ſeen: After that Duct has march'd a little Way, it may be ſeen folded up into the Body call'd *Epididymis* W W, and at Length makes the *Vas Deferens* S S. In Men, and moſt, if not all, Quadrupeds, the *Epididymides* and *Teſticles* cleave ſo to each other, that without ſome Dexterity in Diſſection, the Riſe of them from the *Teſtes* is not to be diſcover'd. This proves to us the Uſe of *Comparative Anatomy*, in detecting the Structure of Parts, which is very obſcure in other Subjects, as well as in Human Bodies: But to return to the *Vaſa Deferentia* S S, after they leave the *Præparentia a b*, as in Men and other Creatures, they grow ſomewhat larger, but on croſſing the *Ureters e e*, become leſs again at their Entrance into the *Urethra*, immediately below the Neck of the Bladder, where

Their Orifices could be perceiv'd on each Side a *Caruncle*: Nor are there any *Veſiculæ Seminales* near the *Vaſa Deferentia* of this Animal, as in Boars, Bulls, Horſes, &c, which nevertheleſs cannot be allow'd to communicate with each other, as in Men: for tho' the *Vaſa Deferentia* and *Veſiculæ Seminales* of thoſe laſt-nam'd Animals empty themſelves into the *Urethra* at the ſame Orifices with the *Veſiculæ Seminales*, yet their Communicant Ducts are ſo very ſhort, that whatever comes by the *Vaſa Deferentia* will ſooner eſcape into the *Urethra*, than be received by the *Veſiculæ*, as in Men.

The Length of the *Urethra*, between the Bladder and the *Penis*, exceeded 4 Inches; more than 3 Inches and a half of which was incloſed with a glandulous Body, analogous to the *Proſtrates* in Men and other Creatures: The Orifices of the Secretory Ducts of this Glandulous Body are very numerous, and open into the *Urethra* on all Sides, as appear'd on opening the *Urethra*; and compreſſing this Glandulous Body or *Proſtratæ*, I ſaw it's ſecreted Juice ſtart out.

Fig. 123,124. This Part of the *Urethra* I K K L, thus incloſed with the *Poſtrates* being very much contorted or folded, in it's Natural Situation between the Bladder and the *Penis*, when there is no Erection, muſt neceſſarily be drawn out, and becomes ſtrait when the *Penis* is extruded, (which I ſhall ſhew by and by happens upon an Erection) by which Means this Glandulous Body is neceſſarily compreſs'd, and the *Succus Proſtratarum* forc'd into the *Urethra*. The *Proſtratæ* of divers Animals are compreſs'd by Muſcles fram'd on purpoſe that incloſe them, as in Boars, Rams, &c. in Men they are compreſs'd by the *Muſculi Levatores Ani*.

At the Root of the *Penis* of the *Opoſſum* we meet with 4 Glandulous *Veſiculæ* M M N N, two on each Side, which empty themſelves into the *Urethra*, and contain a mucous Matter, like that I find in the Glands I lately diſcover'd in this Part in Man. Theſe *Veſiculæ* are not only compreſs'd by the thin broad Sphincter Muſcle above-mention'd, but the Bulbs of the Cavernous Bodies of the *Penis* C C, and *Urethra* E E, when diſtended, (in the Erection of the *Penis*) alſo compreſs theſe mucous Bags. This Compreſſion is effected in Men by the Intumeſcence of the Bulb of the Cavernous Body of the *Urethra* *. In Boars, Rams, Cats, &c. we find Nature ſo ſollicitous to diſcharge the Contents of the Excretory Ducts of theſe Glands, that (like the Gizard of Birds) each mucous Gland is incloſed with a proper Muſcle to compreſs it.

* *Vid.* Supra, V. III. C. IV § C.

The *Penis* fell next under my Examination, the Fabrick of which appears not leſs ſurpriſing than that which Dr *Tyſon* met with in the *Uterus* of the *Female*; and in many Circumſtances differ'd from what I have found in all the Animals that I have hitherto diſſected: beſides
Fig 123, 124. the forked Glands of it's *Penis* B B, it's Cavernous Bodies D D had no Connexion with the *Oſſa Pubis*, nor did the Muſcles call'd *Erectores* or *Directores* C C cleave to any Bone, an in Men and Quadrupeds, but all thoſe Parts lay looſe under the *Oſſa Pubis*. The other Extremities of the two *Corpora Cavernoſa Penis* are receiv'd into the Glands: Nor did the

the *Corpus Cavernoſum Urethræ e*, or it's Muſcles E E cleave to the Fig. 124. *Sphincter Ani*, as in moſt other Creatures, but the whole Body of the *Penis* lay looſe between the Bones of the *Pubis* and the *Rectum*, ſo that on the Intumeſcence or Erection of the *Penis*, it is at Liberty to be extruded from it's *Præputium*, wherein it is ſecured from outward Injuries, when not erected. To favour this Extruſion of the *Penis* in this Animal, the *Urethra* I K L is not only very long between it and the Fig. 123. Bladder O O, but I found it much more contorted, or folded in acuter Angles, than is expreſs'd in the Figures, elſe the *Penis* could not be extruded, but the Bladder O O muſt follow it: beſides, it appears Nature deſign'd this Extruſion of the *Penis* of this Animal in it's Erection, becauſe we meet with Inſtruments to withdraw it again into the *Præputium*. *f f* G ſhews a Pair of Muſcles elegantly framed for that Purpoſe on the Fore-part of the *Penis*; they ariſe fleſhy from the *Corpora Cavernoſa Penis* D D, and becoming tendinous *f f*, as they paſs thro' two Ligaments or Pullies on the *Oſſa Pubis*, and are afterwards united into one Tendon G, which is inſerted into the Upper-part, or *Dorſum Penis*. Beſides this Pair of Muſcles, (which is peculiar perhaps to this Animal) I found another Pair of Muſcles H H, that alſo withdraw the Fig. 123, 124. *Penis*, ariſing from the *Rectum*, and are inſerted into the Extremities of the *Corpora Cavernoſa Penis*: In Cats, Male Porpoiſes, Bulls, Rams, and Boars, we meet with two Ligaments ſpringing from the *Os Sacrum* or *Ilium* on each Side, and inſerted into the *Corpora Cavernoſa Penis* of thoſe Animals, which, like theſe Muſcles, ſerve to withdraw the *Penis* of thoſe Creatures into the *Præputium*.

The *Corpora Cavernoſa Penis* of the *Opoſſum* differ in their Figure from Fig. 123, 124. what we find in other Creatures; their upper Parts are bulbous D D, and cover'd with Muſcles C C, like the Bulb of the Cavernous Body of the *Urethra* in Men: In other Animals, thoſe Parts of the *Corpora Cavernoſa Penis* are of a Conical Figure. The Muſcles of the Cavernous Bodies of the *Penis* of this Creature having no Connexion with the *Os Pubis*, cannot apply the *Dorſum Penis* to the laſt-nam'd Bone, and compreſs the Vein of the *Penis*, whereby to retard the refluent Blood, and cauſe an Erection, as we have obſerv'd in other Creatures; but ſome large Veins of the *Penis* here, take a different Courſe, and paſs thro' the middle Parts of the Bulb K K C, and are only liable to Fig. 125. the Compreſſion made by the Intumeſcence of theſe Muſcles C C, that incloſe them.

But the chief Agent in continuing the Erection of the *Penis* in this Fig. 123. Animal, is the *Sphincter Muſcle* of it's *Anus*, or rather *Cloaca*, to which the broad *Sphincter Muſcle* above-mention'd is continued, and does ſomewhat contribute. When the *Penis* is extruded from the *Cloaca* (which muſt happen when it is erected) the *Sphincter* of that Part neceſſarily embraces it, the like muſt be done by the *Sphincter Muſcle* of the *Cloaca* of the *Female* in Coition: On theſe Accounts I am apt to think theſe Creatures are not very quick in that Act: beſides, the

Fig. 125. Figure of the *Penis*, *Fig.* 125, ſhews an Unfitneſs for it's Retraction, 'till there is a Detumeſcence of it's *Glands* A B, which perhaps does not happen in theſe Creatures 'till both *Male* and *Female* are ſatiated, as in Dogs and other Animals that have Bones in their *Penis*, and have a *bulbous* Intumeſcence of the *Glans* in Coition, and no *Veſiculæ Seminales*, as in this Aninal, and alſo impregnate the *Female* with more than 2 or 3 at a time, as this does.

As the *Bulb* of the Cavernous Body of the *Urethra* in Man, is framed for the Uſe of the *Glans*, to keep it ſufficiently diſtended when required; ſo it ſeems it is neceſſary to have two of thoſe *Bulbs* Fig. 123. incloſed with their particular Muſcles E E in this Animal, to maintain the Turgeſcence of it's doubled or forked *Glans* A B, when the *Penis* Fig. 125. is erected: In this Diſtenſion of the *Glans Penis* of this Creature, the middle Part of the Orifice of the *Urethra* (in which you ſee the Probe paſſing out of *Fig.* 124.) is neceſſarily compreſs'd, as repreſented *Fig.* 125. D, and two diſtinct Apertures C C are left, as appears by the laſt-mentioned *Fig.* 125. A B, on each Side it's forked *Glans*.

They that fancy an *Aura Seminalis* of the Male paſſes by the Way of the Blood of the Female to their *Ovaria* to fœcundate the *Ova*, will here meet with an Inſtance I muſt leave them to ſolve: For to what End has Nature been at the Trouble of making double Emiſſaries for the *Semen* of the Male *Opoſſum*, tho' ſhe deſign'd the Impregnation of a double *Uterus* of the Female? Certainly one paſſage in the *Glans Penis* would have been ſufficient to convey the *Semen Maſculinum* to the Maſs of Blood in the *Female* in the Manner they conceive: Nature would never have been at the Trouble of all this Clutter in this Animal, in making a double *Glans*, and contriving two diſtinct Apertures in the *Glans*, when it's *Penis* is erected, if the Propagation of the Species had not depended on it: Doubtleſs it was for that End chiefly that the *Penis* of this Animal differs ſo much from what we meet with in other Creatures: Nor could the *Penis* of this Animal in theſe Circumſtances, be expos'd in a Prepuce, as in other Quadrupeds, by reaſon of the numerous Accidents that would certainly attend it, in this Animal's Way of living: Nor could it's *Penis* been thus withdrawn, when not erected and ſufficiently extruded, when it is if (as in other Creatures that are retromingent alſo) the *Penis* here had been faſtened to the *Oſſa Pubis*.

Thus we ſee Nature in theſe Inſtances does accompliſh the ſame Ends by different Methods. Altho' there are no *Veſiculæ Seminales* in this Animal, as in Dogs, Weaſels, &c. yet we find it's *Penis* without a Bone in it, as in thoſe Creatures; but then we meet here with additional Contrivances to maintain it's Erection: Not only the *Sphincter* Fig. 124. *Muſcle* of the *Cloaca* of the *Male Opoſſum*, but that of the *Female* alſo, ſo cloſely embraces it's *Penis* in Coition, and effectually retard the refluent Blood from it's *Corpora Cavernoſa*, by compreſſing the Veins

of

Fig. 121.

of the *Penis* E. Nor could the *Penis* of this Animal be fram'd like that in Boars, Rams, Bulls, *&c.* in whom the *Corpora Cavernoſa* are too large, when not erected, to be ſecur'd within the *Cloaca* of this Animal.

Fig. 122.

Fig. 122. Shews the external Appearance of the Genitals of the *Male Opoſſum.*

A B *c c*, The *Anus* or *Cloaca.* A, it's lower Part, which leads to the *Rectum.* B, it's upper Part or Orifice of the *Præputium*, whence the Urine and *Penis* is extruded. *c c*, two ſmall Apertures, whence the yellowiſh colour'd Liquor, that had the peculiar *Fœtor* of the Animal, had it's *Exit.* D, the *Scrotum* juſt large enough to contain the *Teſtes.* E, that Part of the *Abdomen*, where the *Marſupium* is ſeen in the Female, which here appears a little more depreſs'd than in other Animals, but cannot retain the Young Ones, as does the Pouch of the Female. F F, the two Thumbs of the hind Feet, or Hands.

Fig. 123.

Fig. 123. The fore Parts of the Organs of Generation diſſected from the *Male Opoſſum.*

A A, The Body of the *Penis.* A B, the forked *Glans.* C C, the Muſcles analogous to the *Directores Penis* in Men and other Creatures, which here incloſe the *Bulbi* of the Cavernous Bodies of the *Penis.* D D, the two *Corpora Cavernoſa Penis*, before they join and make the Body of the *Penis.* E E, Parts of the two *Bulbs* of the Cavernous Body of the *Urethra.* G *f*, *f*, a Pair of Muſcles, whoſe two Tendons *f f* paſs through two Ligaments or Pullies on the *Oſſa Pubis*, and are afterwards united into one Tendon G, inſerted into the *Dorſum Penis* and ſerve to draw the *Penis* within the *Cloaca*, after an Erection. H H, two other Muſcles which ſerve for the ſame Uſe, and ariſe from the *Rectum*, but are fix'd to the oppoſite Part of the *Corpora Cavernoſa Penis.* I, the *Urethra*, where it has no glandulous Body incloſing it. K K, the *Proſtratæ* or *Corpus Glandoſum*, incloſing the *Urethra*, which lies contorted between the Penis and Bladder of Urine in the *Pelvis* of the *Abdomen* of this Animal. M N, two mucous Bags on each Side, at the Root of the *Penis*, which empty themſelves into the *Urethra.* O O, the Bladder of Urine. P P, the *Muſculi Cremaſteres.* Q Q, the left *Cremaſter* Muſcle incloſing the *Tunica Vaginalis.* R R, the *Tunica Viginalis* of the right Side, open'd to ſhew the incloſed *Vaſa Præparantia* and *Vas Deferens.* S S, the *Vas Deferens.* T V, the *Tunica Vaginalis* incloſing the left *Teſticle* with it's *Epididymis* V. WXYZ, The right Teſticle, as it appear'd on opening the *Tunica Vaginalis.* W, it's *Epididymis.* X, the Body of the Teſticle. Y, the Spermatick Vein and Artery as they paſs to and from the Teſticle. Z, the Excretory Duct of the Teſticle, which could be diſtinctly ſeen ariſing from the *Teſtes*, and marching to the *Epididymis* W, where it is folded up and conſtitutes that Body, whence it is continued to the Bladder of Urine, and call'd *Vas Deferens* S S. *a a*, the

Spermatick Arteries ariſing from the Fore-part of the deſcending Trunk of the *Arteria Magna*, where they have a common *Ductus*, which is divided as it paſſes thro' an Aperture * made on Purpoſe in the Trunk of the *Vena Cava*. *b b*, the Spermatick Veins at their Entrance into the *Cava*. *d d*, the Kidneys. *e e*, the Ureters. *g g*, the Emulgent Veins. Ψ Part of the left Emulgent Artery. *h*, the *Vena Cava* below the Liver. *i i*, the deſcending Trunk of the Great Artery. *k k*, the Meſenterick Arteries. *l*, the lower Meſenterick Artery, which in this Animal does not ariſe from the Great Trunk. *m*, the left *Glandula Renalis*, that of the right Side being plac'd behind the Trunk of the *Vena Cava n*. *o*, a common Trunk of an Artery, from whence ſprings the Gaſtrick, the ſuperior and inferior Meſenterick, and the Emulgent Arteries of this Animal. The Deſign of Nature in confining all thoſe Arteries to one Trunk in this Animal, might be perhaps in favour of it's uſual Poſture of hanging by it's Tail with it's Head downwards. This Trunk of the Arteries of the *Viſcera* of the lower Belly, having ſo many united Forces, is the leſs liable to any Compreſſion that might be made by the contain'd Parts of the lower Belly in that Poſture.

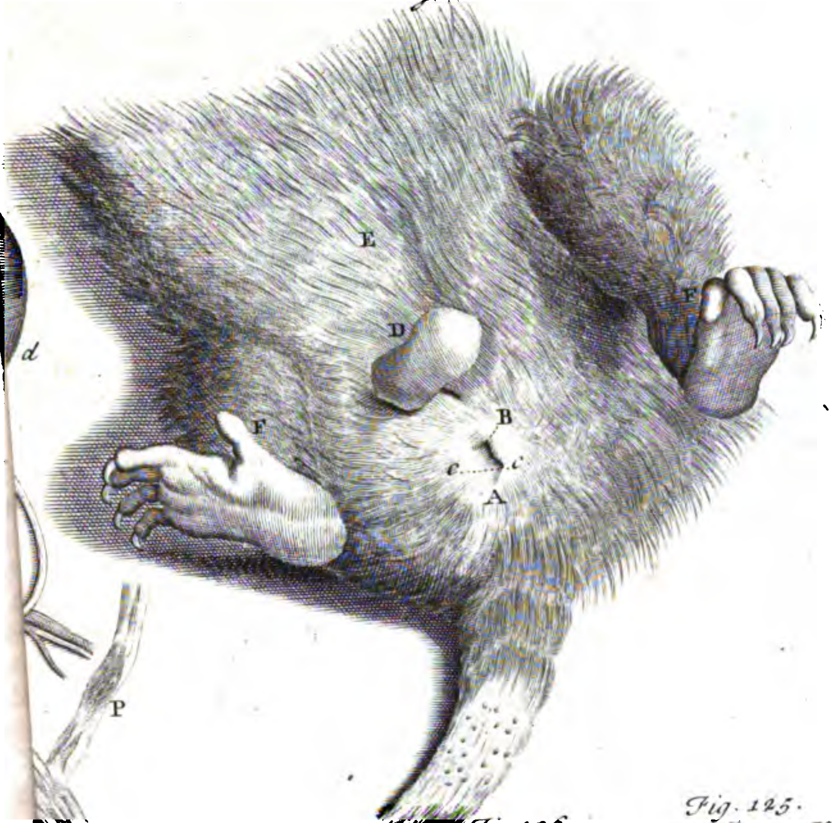
Fig. 124. *Fig.* 124. The back Side of the *Genitals* of the *Male Opoſſum*. A, the Body of the *Penis*. B, it's Glans. C C, the *Bulbi* of the *Corpora Cavernoſa Penis*, cover'd with their Muſcles. D D, the *Corpora Cavernoſa Penis*. E E.... the two diſtinct *Bulbs* of the Cavernous Body of the *Urethra*, incloſed with their particular Muſcles. F F G, Parts of the Muſcles expreſs'd on the Fore-part of the *Penis* in the preceding Figure. H H, the other Pair of Muſcles ſpringing from the *Rectum*, and inſerted to the Sides of the *Corpora Cavernoſa Penis*. I K L, the *Urethra* cover'd with the *Proſtratæ* K L K. M N, the two mucous Bags on each Sde. O, the Bladder of Urine. P, the *Muſculus Cremaſter*. Q, the *Tunica Vaginalis* open'd. R, *Vaſa Præparantia* cut from the Great Trunks. S S, the *Vas Deferens* on each Side. WXYZ, the left Teſticle, as in the preceding Figure, with the oppoſite Side here towards you. *e e*, Parts of the Ureters. **, a Probe inſerted into Part of the *Urethra*.

Fig. 125. *Fig.* 125. The Fore-part of the *Penis*, as it appears when it's *Corpora Cavernoſa* are fill'd with Mercury and dry'd, figur'd half as big as the Life. A B, it's forked *Glans*. C C.... the two diſtinct Apertures that appear in this Diſtenſion or Erection of it's *Corpora Cavernoſa*. D.... the middle Part of the Orifice of the *Urethra*, which is occluded on the Intumeſcence or Erection of the *Penis*. E... the two Veins of the *Glans*, which are compreſs'd by the two *Sphincter Muſcles* of the *Male* and *Female* in Coition. F, the *Bulbs* of one of the Cavernous Bodies of the *Penis* diſtended. G, one of the *Bulbs* of the Cavernous Body of the *Urethra* alſo diſtended. Theſe *Bulbi* were open'd on the other Side, Ψ to fill the Cavernous Bodies with Quickſilver, but are all expreſs'd as they ought to appear on both

Sides

ate VIII.

Fig. 122.



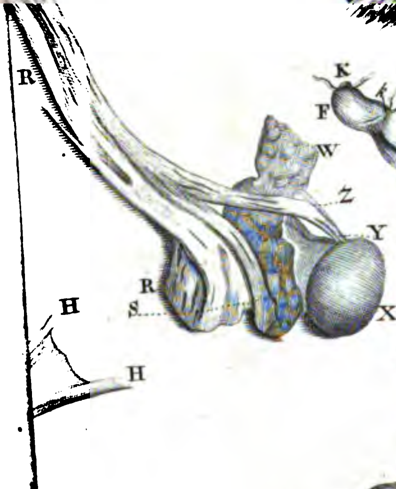


Fig. 126.

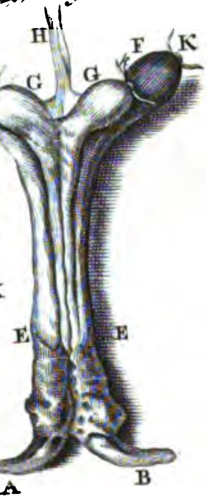
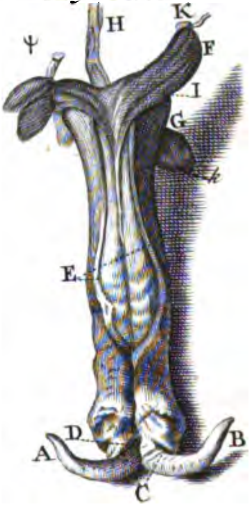


Fig. 125.



M. V.dr Gucht Sculp.

Sides in the following Figure. H, The *Urethra*. I, The Muſcles dried, expreſs'd *Fig.* 123, and 124, F, F, *f*, *f*, G. K, *k*, The Veins tied up to keep in the Mercury, as they paſs the Muſcles of the *Bulbi*.

Fig. 126.

Fig. 126. The Back-part of the *Penis* expreſs'd in the preceding *Fig.* A, B, it's forked *Glans*. E, E, Parts of the Veins ariſing from the *Glans*. F, F, The Bulbs of the Cavernous Bodies of the *Penis*. G, G, The two Bulbs of the Cavernous Body of the *Urethra*. H, the *Urethra*, K, K, *k*, *k*, The Veins tied up, as they paſs out of the *Bulbi* to keep in the Mercury.

Obſervations on the Opoſſum. *And a* New Diviſion *of* Terreſtrial Brute Animals, *by Dr* E. Tyſon, n. 290. p. 1565.

XXVI. I formerly gave an Account in the *Philoſ. Tranſ.* N° 239. † of the *Female Opoſſum* (as Mr *Cowper* has of the *Male* :) I ſhall add now only a few Obſervations for the farther illuſtrating the Hiſtory of this *Animal*.

† *Vid.* Supra. Vol. II. C. VI. §. CIX.

In deſcribing the *Ears*, I had not an Opportunity of obſerving that *white Rim* that incircles them, which is very beautiful: for when in Health, for the Breadth of two Lines or more, there runs an *Edging* round the Verge of the *Ear*, of a perfect *Milk white* Colour. But the *Ear* here being ſo very thin and tender, 'tis eaſily affected by Cold or Illneſs, and then this white Part becomes jagged and crimpled, as if burnt up, and the Whiteneſs diſappears; as it happened in this laſt Subject before it's Death, as well as the firſt, which occaſioned my not obſerving it then. 'Tis on this Account that *Margrave* in his Deſcription of the *Tai-ibi* of *Braſil*, which now I take to be the *Male Opoſſum*, ſaith, it has *Aures ſubrotundas*, *molles*, *graciles*, *albas*, *teneras ut Charta*, *molles*, not that the whole *Ear* was *White*, but only the *Edges*.

But what I was moſt deſirous to know, was, whether the *Male* had that *Marſupium* or *Pouch* for receiving the Young, as is affirmed by ſome I have named in my former Account. Mr *Cowper* in the Subject he diſſected, neither obſerved the *Pouch* nor the *Muſcles* belonging to it, as has been deſcribed in the *Female*: Nor indeed did I in that I diſſected. Only this I took notice of when firſt I had it; that the *Skin* here ſeemed to be looſer; ſo that with my Finger I could eaſily thruſt it in, and by turning it round, could form for the preſent a *Pouch*; but this would eaſily turn out again, upon withdrawing my Fingers. Whether therefore 'tis capable of being formed into a *Pouch* or *Marſupium* upon Occaſion, I ſhall leave as a Query to be reſolved by thoſe that live where they breed, Whether they ever obſerve the *Male* to receive the Young ones, as do the *Females*?

However, in the *Male*, there were thoſe Bones I call *Marſupialia*, and I obſerved Muſcles running from them to their hinder Legs, which no doubt, are very ſerviceable to them in drawing up their Bodies, as I find Mr *Cowper* has likewiſe remarked.

I ſhall further add, to confirm what *Oppian* and others I have named before, write concerning *Fiſhes* receiving their Young ones into their

Bellies; that Mr *Herbert* in his Travels (*Lib.* 1. *Pag.* 23.) ſaith, That in their Voyage they took a *Shark*, 9 Foot and a half long; and found in her *Paunch* 55 Young ones, each a Geometrical Foot in Length; *all which*, he adds, *go out and in at Pleaſure.*

As to the *Brain*, I obſerved that being taken out of the *Cranium*, it weighed two Drachms and two Scruples. I did not find either in the *Cerebrum*, thoſe *Anfractus*, or in the *Cerebellum* thoſe *Circilli* which we uſually meet with in other *Brains*. The whole was of an oblong Figure, and ſeem to be divided into three Parts, *i. e.* The *Cerebellum* the *Cerebrum*, and that part of the *Cerebrum* which was projected into the *Roſtrum*. For by the pinching in of the *Cranium* here, the forepart of the *Cerebrum*, from whence iſſued the *Proceſſus Maxillares* and *Olfactory Nerves*, was by this Conſtriction, remarkably diſtinguiſhed from the *Cerebrum*; like an *Anterior* Brain. In the *Vermin* Kind, and thoſe that have a long *Roſtrum*, I have obſerved the like. For Nature here ſeems to give them more particularly the Advantage of the *Senſe* of *Smelling*, for finding out their Prey, or avoiding the Danger they would ſhun.

So likewiſe I obſerved the *Optick Nerve*, as likewiſe the *Eye*, to be large; the better to look out for the one, or the other. And when I have mentioned the *Auditory* Nerves to be large likewiſe for the ſame Reaſon, to give them a quick Senſe of hearing any ſudden Noiſe, and ſo to avoid the Danger, theſe were the greateſt Remarks I made upon the *Nerves*.

It was obſerved that it ſaw beſt in the Twilight, and not ſo well in the bright Sun; which I was eaſily brought to believe, becauſe it was then to ſeek out for it's Prey.

In the *Eye* I obſerved the *Membrana Nictitans*; the *Glandula Lachrymalis* was large and oblong; there was the *Muſculus ſeptimus ſuſpenſorius*; and the *Cryſtalline* Humour was large, very tranſparent, and almoſt of a globular Figure; the Eye or *Iris* black.

A new Diviſion of Terreſtrial Brute Animals. *ibid.* p. 1566.

In my Account of the *Male Opoſſum*, I queried to what *Species* in the Predicament of Animals this Creature might probably be reduc'd? Now having upon Diſſection obſerved the *Penis* to be fleſhy, and to have no *Bone* in it; I find it cannot be referred to the *Dog* or *Weaſel* kind, as ſome have thought; and what *Piſo* means by his *Glires majores montani*, to which he refers it, I ſhall not here enquire. I muſt confeſs we cannot be at a Certainty in this Matter, unleſs we had a more perfect Enumeration and Deſcription of the ſeveral ſorts of Animals that are in the World; and by a ſtrict Enquiry into their *inward* as well as *outward* Parts, obſerved how gradually they differ from one another; by eaſy and gentle Steps, the intermediate *Species* linking the whole together. However till this can be attained, every little Help will contribte ſomewhat.

To give therefore my Thoughts on this Subject, I ſhall here propoſe a *Diviſion* of ſuch *Terreſtrial Animals*, as have many *divided Claws* and *Nails* at the End of them into

Animalia {
Χειρο-δάκτυλα *ſeu Manu digitata, i. e.* whoſe *Feet* reſemble *Hands*, and have *Fingers*, rather than *Toes*.
Ποδο-δάκτυλα *ſeu Pede digitata, i. e.* whoſe *Digiti*, from the Order of their Poſition and Shortneſs, as alſo Uſes, more reſemble *Toes* than *Fingers*.

For tho' our Language make a ſufficient Diſtinction between them, by calling one *Fingers*, the other *Toes*; yet the *Greek* and *Latin* do not; for δάκτυλοι and *Digiti* ſignify thoſe on the *Hand*, and *Feet* likewiſe. To diſcriminate them therefore they are obliged to add another Word, as *Digitus Manûs*, or *Digitus Pedis*; which ſufficiently juſtifies our Diſtinction of Χειρο-δάκτυλα and Ποδο-δάκτυλα.

Now we may obſerve theſe Differences between the *Fingers* and *Toes*, *viz.* that the *Fingers* are much longer, having uſually a *Thumb* ſet at a Diſtance from the Range of the other Fingers; and are ſo contrived for the better holding what they have a mind to, and eſpecially in theſe Animals, to aſſiſt them in *climbing* Trees, *&c.* for catching their Prey. Whereas the *Toes* are ſhorter, and are ſet in a more even Range together, and better contriv'd for ſwift *running*, by which way this other ſort of Animals take their Prey

This latter Sort we ſhall not inſiſt on here, but rather give a *Subdiviſion* of the former, *viz.* Thoſe Animals which have their *Feet* formed like *Hands*. Now where there is a *Thumb*, tho' we may eſteem the *Hand* there more perfect, yet I find 'tis not always neceſſary; for in ſeveral Animals 'tis wanting, as will appear by the following *Scheme*; which I propoſe here only as an Eſſay or Hint, by farther Obſervations to be enlarged and amended.

Animalia Χειρο-δάκτυλα *Quorum*

Pedes
- *omnes ſunt Manu-formes, ſeu Animalia Quadru-mana.*
  - *cum Pollice in Omni Pede, ſc.*
    - Simia
      - *Caudata.*
      - *Non Caudata*
    - Romack.
    - Coati *Braſil.*
    - *&c.*
  - *Sine Pollice in Pedibus.*
    - *Anterioribus*
      - Vantrevan.
      - Sciurus.
      - Mus, *&c.*
    - *Poſterioribus*
      - *Genus Felinum.*
- *Duo antùm ſunt Manu-formes, ſc. vel*
  - *Anteriores*
    - *Cum Pollice*
      - Mantegar,
      - *&c.*
    - *Sine Pollice*
      - Cuandu *Braſil. Margravii.*
      - Tlaquatzin *Spinoſum Hernandez.*
      - Hyſtrix.
      - Tamandua *Braſil.*
      - *&c.*
  - *Poſteriores*
    - *Cum Pollice*
      - Carigueya. *S. Opoſſum,*
      - *&c.*
    - *Sine Pollice.*

Under the firſt Member of this Diviſion I include the *Ape* and *Monkey* Kind, which I have ſhewn in my Diſcourſe of the *Ourang Outang*, ought rather to be reckoned a *four-handed* than a *four-footed* Animal. And conſidering how large a *Species* of Animals may be reduced under this *Quadrumanous* Kind, agreeing in this particular, tho' in others different, I think it but juſt to aſſign them a General *Claſſis*, afterwards to be ſubdivided according to the gradual Differences they have from one another.

The *Romack* therefore, tho' in the Head and Face much different from the *Monkey* Kind, yet being *Quadrumanous*, and on each *Hand* having a *Thumb*, I reduce under this Head. This Animal was brought alive from *Fort St George*. Whether it is deſcribed by any, or what other Names 'tis call'd by, I do not know. Hereafter, it may be, I may give a Deſcription of this and ſome others of the *Ape* and *Monkey* Kind, in an *Appendix* to my Diſcourſe of the *Ourang Outang*. And becauſe in it's Face and Head it ſo much reſembles a *Fox*, and in the reſt of it's Body a *Monkey*, for the preſent I ſhall call it 'Αλωπη-πίθηκος *Vulpi-Simia*, or the *Fox-Monkey*. But the next I have mentioned in this Claſs, the *Coati* of *Braſil* and *Virginia*, or the *Rackoon* or *Rattoon*, tho' in it's Body it does not reſemble the *Monkey* Kind, yet becauſe it has Hands like a Monkey, as *Margrave* tell us, I place likewiſe here; as may be all others, whoſe *Feet* are all form'd like *Hands*, and have a *Thumb* in each.

For there are ſome that have not a *Thumb* on the *fore Feet*, and others that want one on the *hinder*.

In the Number of the former may be reckon'd the *Vantrevan*, the *Squirrel* Kind, and *Mouſe* Kind, or any others that may be obſerv'd to have all their *Feet* form'd like *Hands*, only on their *fore Feet* do want a *Thumb*.

The *Vantrevan* (as 'twas call'd by the Perſon that ſhew'd it here in *London*) altogether reſembles a *Monkey*, which on the *fore Feet* had only 4 long *Fingers*, and no *Thumb*. 'Tis a beautiful Creature, very briſk and nimble in Motion, and loving; has a very long *Tail*, by which it ſuſpends it's Body, as does the *Opoſſum*.

The *Squirrel* Kind on the *fore Feet* have 4 long *Fingers*, on the *hinder* five, and one like a *Thumb*. It makes uſe of it's *fore Feet* like *Hands*, in holding up it's Food to it's Month, and lives on Trees, as do the *Monkeys*. But the Affinity between the *Monkey* and *Squirrel* Kind, does better appear by ſome *Monkeys* I have ſeen, which on the *Belly* have a large thick Fur, and a thick buſhy *Tail* like the *Squirrel*; whereas uſually on the Belly the *Ape* and *Monkey* are thinner of Hair, and that on their Tail is ſhorter. This Sort of *Monkey* I call therefore the *Squirrel Monkey*, or *Sciuro-Pithecus*, and have made a Figure of one of them; but it's *Face* more reſembles a *Man*'s or an *Ape*'s, as likewiſe it's *Teeth*, and in theſe reſpects is much different from the *Squirrel* Kind.

Nearer to the *Squirrel* comes the *Mouſe* Kind, which in the Shape of it's *Head*, the long *Teeth* before, and the large and prominent Eyes, more reſembles the *Squirrel* Kind, and makes uſe of it's *fore Feet*, as *Hands*, in feeding itſelf, where it has only 4 *Fingers* without a *Thumb*, but on it's *hinder* has 5, of which the inwardmoſt and outwardmoſt are plac'd at a Diſtance from the Range of the 3 middle *Fingers*, like 2 *Thumbs*, as may be obſerv'd in ſome of the *Lizard* Kind.

Why we ſhould include the *Cat* Kind in the Number of the *Animalia*, Χειρο-δάκτυλα, ſome may queſtion, ſince their *Feet* ſeem rounder, and to have rather *Toes*, than *Fingers*. But we may obſerve that it uſes it's *Fore-feet* like *Hands* in climbing and catching it's Prey; and when it does ſo, it exerts it's *Claws* and lengthens them; but when it uſes it's *Feet* in going and running, it ſhortens them, that being moſt convenient for that Purpoſe, ſo that 'tis well provided for both, and it's *Digiti* are of a middle Nature between *Fingers* and *Toes*, as they are lengthened or ſhortened. And we may obſerve on each *Fore-foot*, is a *Pollex* or *Thumb* ſet at a Diſtance from the Range of the other *Claws*, whereby they more reſemble *Hands*, and on the *Hinder-feet* there are only 4 *Digiti* without a *Thumb*.

We come next to thoſe Animals that have only two *Feet* formed like Hands, and thoſe are either the *Fore-feet* or the *Hinder*.

Thoſe whoſe *Fore-feet* only are formed like *Hands*, have either a *Thumb* there, as the *Mantegar*, &c. or have only four *Fingers*, without a *Thumb*, as the *Cuandu*, &c.

The Mantegar.

The *Mantegar* is an Animal not deſcribed, as I know of, by any Author, and the ſtrangeſt that I have ſeen. It is about the Bigneſs of a Maſtiff Dog; it meaſured from the End of it's *Noſe* to the *Anus* 3 Foot 2 Inches; the Girth of the *Body* 2 Feet 2 Inches; the *Head* 14 Inches long; the *Forehead* 5 Inches broad; the *Head* ſomewhat reſembling an Horſe's; the *Noſtrils* large; the *Noſe* of a deep *Cinnabar* Colour, and the *Bones* of the *Noſe* depreſſed lower than thoſe of the *Upper Jaw*, where the *Skin* was of an *Azure* blue Colour; a large Tuft of Hair on the Forehead, and likewiſe under the Chin; the Fore-part of the Body and Inſide of the Arms and Legs almoſt bare of Hair, the Hair on the Outſide of them, of a mottle Brown and Olive Colour; on the Back blackiſh: There were *Mammæ* on the Breaſt; an *Umbilicus*; and the *Præputium* without a *Frænum*, as in the *Ape-kind*: the *Præputium* of a *Vermillion* Colour; the *Scrotum* of an *Azure*; it had no *Tail*; 'tis very fierce, having 2 long *Tuſks* in the Upper Jaw, and very laſcivious; the *Fore-feet* perfectly reſemble *Hands*, having long and thick *Fingers*, and a *Thumb*, and all the *Nails* of thoſe Fingers *flat*; the *Nails* and the hinder Toes and Fingers *imbricated*, not flat; and tho' the *Claws* were pretty long, and ſomewhat imitating Fingers, yet the *Thumb* not ſo perfect, and the whole different from the Fore-feet. When ſitting and ſupporting itſelf by a Stick in one Hand, being thus erect, and holding a Cup in the other, it would drink out of it, and not lap, it's Food was chiefly Fruits.

Amongſt thoſe Animals whoſe *Fore-feet* are like *Hands*, and have no *Thumb*, I reckon the *Porcupine* kind, as the *Cuandu* of *Braſil*, a ſort of *Porcupine* deſcribed by *Margrave* and *Jo. Nieuhoff* (*Voyages*, pag. 18.) which on the *Fore-feet* hath but 4 Fingers on the *Hinder* 5. Therefore, as *Margrave* obſerves, for want of a *Thumb*, it is but ſlow in climbing Trees; but the better to help himſelf, it twiſts it's *Tail* about a Bough, to ſave itſelf from falling. And much alike, if not the ſame, is the *Tlaquatzin Spinoſum* of *Hernandez*. So the common *Porpcupine*, before has 4 Fingers, behind 5. So the *Tamandua* of *Braſil*, or *Ant-Bear*, before has but 4 Fingers, where the want of *Length* in the *Fingers*, is ſupplied by that of the *Nails*, and behind has 5 *Toes*. But I muſt confeſs there muſt be ſome Allowance made for ranging this *Anomalous Animal* (as Mr *Ray* calls it) here. But becauſe he *climbs* Trees, and in doing this make uſe of his *Tail*, as ſome others here mentioned do, I was willing to put him into the Croud. And, unleſs it can be otherwiſe better ranged, we may likewiſe ſhuffle in here the *Ai*, *Ignavus* or *Sloth*, becauſe it *climbs*, and lives on Trees, and has a Head not unlike an *Ape's*; and, as *Margrave* aſſures us, two *Teats*, on the *Breaſt*, but on each *Foot* had but three *Claws*, with very long *Nails*, like the *Tamandua*, and it's Feet being very narrow, and thus defective in Toes, 'tis very ſlow in Motion.

To conclude this *Scheme*, amongſt the Animals, whoſe *Hinder-Feet* only are like *Hands*, is to be reckon'd the *Carygueya* or *Opoſſum*, which having deſcribed at large in the Anatomy of the *Female Opoſſum*, I ſhall not inſiſt farther on it here; and if there be any other Animals that have their *Hinder-feet* formed like *Hands*, either with or without a Thumb, they may be reduced hither; my chief Deſign in this *Scheme* being (as near as I could) to include all thoſe Animals that are obſerv'd to *climb* and *live* on *Trees*, into a *Claſs* together; and they being obſerv'd to have their *Claws*, either all or many of them form'd like *Fingers*, I place them therefore under this general Title of *Animalia* Χειρο-δάκτυλα.

XXVII. *Papers Omitted.*

1. Some Obſervations concerning *Inſects* made by Mr *J. Baniſter* in *Virginia*, A D. 1680, with Remarks on them. By Mr *J. Petiver*.	n.270. p. 807.
2. An Account of ſome *Animals* ſent from the *Philippine Iſles*. By G. *J. Camelli* to Mr *J. Petiver*. By Mr *J. Petiver*.	n. 277. p. 1065.
3. An Account of ſome *Animals* ſent from *Fort St George*. By Mr *E. Bulkeley*, to Mr *J. Petiver*. By the ſame.	n.271. p. 843.
4. An Account of ſome *Animals* ſent from *India*. By the ſame.	n. 276. 1023.
5. *G. J. Camelli* Obſervationes de *Avibus Philippenſibus*.	n. 285. 1394.
6. *G. J. Camelli* de Piſcibus, Moluſcis, & Cruſtaceis Philippenſibus.	n. 302. 2043.
7. *G. J. Camelli* de Quadrupedibus *Philippenſibus*.	n. 305. 2196.
8. *G. J. Camelli* de Monſtris, quaſi Monſtris & Monſtroſis; item de Serpentibus, Viperis, *&c. Philippenſibus*.	n. 307. p. 2266.
9. *G. J. Camelli* de variis Animalibus *Philippenſibus*.	n.318. p.241.
10. *G. J. Camelli* de Araneis, & Scarabæis *Philippenſibus*.	n. 331, p 310.
11. An *Extract* from the *Acta Eruditorum*, for the Month of *March* 1713, *pag.* 111.] De *Contagioſâ Epidemiâ* quæ in *Patavino* Agro, & tota fere *Veneta* Ditione, in *Boves* irrepſit Diſſertatio. Auctore *Bernardino Ramazzini*, Practicæ Medicinæ Profeſſore Publico. *Patavii*, 1712. *Octavo*.	n. 338. p. 46.

CHAP.

CHAP II.

ANATOMY, DISEASES.

A General Paper, and of the Skin.

Obſervations *in a* Courſe *of* Anatomy *of* Marchetti'*s at* Padua *by the late* Mr J. Ray, *communicated by* Mr S. Dale. n. 307. p. 2282.

I. OBSERVATIONS upon a Body diſſected at *Padua* by *Marchetti*, begun the Tenth of *December* 1683.

He began the Diſſection in the ſame manner as Anatomiſts commonly do, *viz.* by cutting the Skin of the Belly in the form of a Croſs, but without touching the Navel.

He ſeparated the *Scarf Skin* from the Skin by holding a lighted Candle to the Skin, which made the Cuticle riſe into a Bliſter, whereby he eaſily ſeparated it with a Knife. The Cuticle cannot be ſeparated from the Skin unleſs by Bliſtering, either with the actual or potential Cautery.

Under the *Skin* a great deal of *Fat* half an Inch thick ſurrounded the whole Abdomen. The Fat was kept firm by a great many ſmall Fibres, like ſo many Fulcra to ſupport it, and hinder it's running off.

Under the *Fat* was the *Membrana Carnoſa*, which however in this Part did not appear fleſhy: There was likewiſe under this Membrane ſome Fat, but very little. This Membrane he affirmed to be double in Brutes, becauſe they are able to move and wrinkle the whole Skin; in Man it is likewiſe double upon the Forehead, and hence he can contract and wrinkle it; in ſome People too it is double on the hind Head, whereby they can move the whole Scalp. *But others aſſign a different Reaſon for thoſe Motions,* viz. *becauſe both in the Fore-head and Occiput the Membrana Carnoſa adheres firmly to the Skin, and degenerates into a Muſcle, which is more probable than the other.*

Next he went on to the *Abdominal Muſcles*, and firſt of all to the *deſcending Oblique*, which ariſing from the Middle of the falſe Ribs by ſo many Digitations, are adapted to the like number of Digitations of the *Muſculus Serratus Anticus Major* of the Thorax, after the ſame manner as the Sutures of the Bones. In the back Part the *latiſſimus Dorſi* Muſcle lies upon it, and therefore he was obliged to raiſe it a little firſt.

The *Muſculi Recti*, connected by a broad Tendon to the Eminences or Proceſſes of the *Oſſa Pubis* ariſe above on each Side by nervous Tendons, from the Cartilage of the firſt fallen Rib, near the *Cartilago Enſiformis*.

The *Aſcending Oblique Muſcles*, ariſing by radial Fibres from the upper Margin of the *Os Ilium*, receive a muſculous Vein from the Branches of the *Iliacks*. Secondly, theſe ſame *Oblique Muſcles* in which there was nothing ſingular, ariſe from the Top of the *Os Ilium*, and have a double Tendon, which embraces as it were the *Muſculi Recti* : viz. one Part of it lies upon the *Muſculus Rectus*, and before it has got over half the breadth of that Muſcle, coheres firmly, or rather is united into one, with the Tendon of the deſcending Oblique Muſcle, ſo that it is impoſſible to ſeparate them from one another ; while the other Part, paſſing under the *Muſculus Rectus*, coheres in the ſame manner with the Tendon of the tranſverſe Muſcles of the Abdomen. It receives a Vein from that called *Muſcula*, which is a Branch of the *Iliack*.

The *Muſculi Recti*, had only two tendinous Interruptions, whereas in ſome Bodies they have three, in ſome four, and in ſome five, as *Veſlingius* obſerves. In theſe Muſcles, we obſerved the Anaſtomoſes of the internal Mammary and Epigaſtrick Veins.

The *Tranſverſe Muſcles* ariſe from the Proceſſes of the Vertebra of the Loins ; but as he obſerves, the aſcending oblique Muſcles of the Abdomen are not connected to theſe Vertebræ.

We likewiſe obſerved in this Body the *Pyramidal Muſcles*, lying obliquely upon the *Recti*.

Obſ. 1. The Fat upon the Back is more fluid and ſoft in Women than in Men.

2. The Skin in thoſe that have bore Children is wrinkled about the Ilia, but in Virgins it is not ſo.

3. A Vein, Artery, and Nerve, always accompany one another, the Artery running upon the Right, the Vein in the middle, and the Nerve on the Left.

4. Under the Muſcles upon the Peritonæum near the Loins we obſerved a great deal of Fat, whence in this Part the Muſcles are eaſily ſeparated from the Peritonæum, but near the Linea Alba this Membrane coheres ſo firmly with the Tendons of the Muſcles, that it is impoſſible to ſeparate them from one another.

5. He affirmed that the Muſcles in their Origins or Heads are tendinous.

6. He began to diſſect the Muſcles from their Heads or Origins ; becauſe by this the Motion or the Uſe of a Muſcle in it's Motions is more eaſily diſcovered.

7. Surgeons ought to take Care not to cut the Muſcles acroſs their Fibres, becauſe thereby there is Danger, leaſt by cutting the Nerves, (which always run parallel with the Muſcular Fibres) Convulſions ſhould be brought on.

8. Whoever wants to diſſect and ſeparate the Muſcles nicely, ought accurately to obſerve the Fibres, and follow their Directions.

9. The Tranſverſe Muſcles both at their Origin and Inſertion have a broad tendinous Membrane.

Next he ſhewed the *Vertebræ* of the *Loins* five in Number ; and each of them having ſeven Proceſſes, *viz.* one Spinal, two Tranſverſe, two oblique Aſcending, and two oblique Deſcending. The oblique Aſcending of the lower Vertebræ, is articulated by Ginglymus with the oblique deſcending of the contiguous one above it; but the Vertebræ themſelves are connected by Harmonia, *viz.* the Cavity of the upper one receives the Protuberance of the one next to it below.

The *Os Sacrum* is compoſed ſometimes of ſix Bones, but commonly of five. When of ſix, the *Os Coccygis* has only three Bones, when of five it has four. The *Os Coccygis* is crooked below for more convenient ſitting.

In difficult Labour, the Surgeon by thruſting his Finger up the *Rectum*, and pulling back the *Os Coccygis*, may facilitate the Birth; which *Marchetti* affirms he has done himſelf.

The *Os Sacrum* has large Foramina for the Nerves to go out at.

He aſſerts that theſe Bones which conſtitute the Pelvis, are not larger in Women than in Men in Proportion to the Bulk of the Body, as other Anatomiſts affirm.

The *Os Ilium*, the *Os Pubis*, and the *Os Coxæ*, or *Iſchion* in Adults, grow together as it were into one Bone, but in Children they are diſtinct, and connected by a Cartilage. All theſe three Bones join together in the Acetabulum, and each of them helps to conſtitute a Part of it. He diſtinguiſhed the *Os Ilium* into the Margin, the Spine, the Back, and two Sinuſes, *viz.* the upper, upon which a Nerve going out from the uppermoſt Foramen of the *Os Sacrum*, paſſes as it deſcends to the Thigh; and the lower between the two Eminences for the Convenience of ſitting.

The Nerves go out at the Sides of the Vertebræ, by the Foramina formed between each of the two Vertebræ.

He ſhewed the Bowels and Inteſtines in their natural Situation; *viz.* the *Colon* ſurrounding all the Inteſtines; the *Cæcum* on the right Side about the Bigneſs of one's little Finger, and he aſſerted that he had never found it neither larger, nor full of Excrements in Fœtuſes nor in Infants. Immediately above the *Cæcum* begins the *Ilium*, which is both larger and full of Fæces. Next comes the *Jejunum*, which is both more fleſhy, red, and vaſcular, and void of Excrements. The *Duodenum* terminates at it's Flexure.

That Part of the *Meſentery* to which the *Colon* is connected is called the *Meſocolon*; the reſt of it to which the ſmall Inteſtines are attached κατ' ἐξοχὴν by way of Pre-eminence, is called *Meſentery*. The lower *Meſenterick Artery*, ſcatters Branches through the whole Colon and alſo the Rectum, whence the *Hæmorrhoidal Artery*; the reſt of the Inteſtines are ſupplied from the upper *Meſenterick Artery*.

The *Spleen* in this Body was larger than natural; which he attributed to drinking.

The *Colon* adhered to the Peritonæum.

The *Pyramidal Muſcles* ariſing on each Side from the Proceſſes or Eminences of the *Os Pubis*, and aſcending obliquely, terminate by their contiguous Tendons in the *Linea Alba*. The Uſe of theſe Muſcles is to expel the Urine by compreſſing the Bladder, according to *Fallopius*, when they are a wanting (as is ſometimes the Caſe) the Extremities of the Muſculi Recti are broader.

He ſhewed us beſides the *Umbilical Vein*, which is inſerted into a Fiſſure of the *Liver*, and degenerates into a *Ligament*, the *Umbilical Arteries*, which being connected to the Peritonæum run as far as the Iliack Branches of the great Artery: And the *Urachus*, which being likewiſe connected to the Peritonæum deſcends to the Bottom of the Bladder, and ſupports it, as alſo in Man it performs in ſome Meaſure the Uſe of a Ligament, and is not quite perforated.

He ſhewed us likewiſe the *Tubes* of the *Womb*, the *Round Ligaments*, the *Female Teſticles* or *Ovaria*, the *Spermatick Veſſels*, and alſo the *Broad Ligaments*.

The *Broad Ligament* of the *Liver*. This Viſcus in living and ſound Perſons does not lie upon the Stomach, and therefore Ointments, Fomentations and Epithems, may very fitly be applied externally to the Region of the Stomach.

The *Round Ligaments* of the *Womb* perforate the Peritonæum and all the Muſcles, and afterwards dividing ſend one Branch to the *Clitoris*, and another down the Thigh.

He ſhewed us the *Gaſtrick* and the *Gaſtro-epiplaick Veins* and *Arteries*, accurately diſſected; but in theſe he does not altogether agree with *Veſlingius*, whom I attended.

Obſ. 1. *Buboes* are ſometimes produced in Perſons who are chaſte, but in theſe they may be diſcuſſed without a Suppuration: On the contrary, your *Venereal Buboes*, unleſs a *Gonorrhæa* comes on, always ſuppurate.

2. We obſerved a Valve in the beginning of the Colon; and *Marchetti* aſſerted from his own Obſervation, that the *Iliack Paſſion*, or *Volvulus*, is owing to an Inflammation of that Valve, which hinders the Excrements from paſſing downwards; for he had ſeen that Foramen ſhut up ſo very cloſe, as not to admit the Point of a Needle.

The Veins of the Stomach are either proper or common. The proper are, 1. The *leſſer left Gaſtricks*, three or four in Number, (the firſt and ſhorteſt of which is called the *Vas breve*) ariſing from the Splenick Branch of the *Vena Portarum* near the Spleen. 2. The *greater left Gaſtrick*, or *Coronary*, becauſe it is ſpread upon the upper Part of the *Stomach* in form of a Crown. 3. The *right Gaſtrick*, or *Pylorick*. The common are, 1. The *left Gaſtro-epiploick*, which ariſing from the *Splenick* Branch near the *Spleen* gains the *Fundus* of the *Stomach*, ſends off ſeveral Branches both to the *Stomach* and *Omentum*, eſpecially one remarkable one to the *Omentum*, called the *left Epiploick*. 2. The *right Gaſtro-epiploick* ariſing in this Body from the Meſenterick Branch near the Pylorus, and gaining in the ſame manner as the former the Bottom of the *Stomach*, is firſt ſpread upon the Stomach, and then upon the *Omentum*, it's greateſt Branch or Trunk being joined by Anaſtomoſis with the right

Gaſtro-epiploick. This is a very conſiderable Vein, and ſends off one Branch a good deal larger than the reſt called the right *Epiploick* Vein.

In the Bottom of the *Gall-Bladder* there are no conſpicuous Veſſels which convey the *Gall* to it, but only certain Poroſities which allow it to paſs, and beſides when the *Gall-Bladder* is ſeparated from the *Liver*, the bilious Humour manifeſtly tranſudes. Further there are ſome Capillary Veins going from the *Parenchyma* of the *Liver*, ſpread upon the Membranes of the *Gall-Bladder* in ſuch a manner, that there is no ſeparating it from the *Liver* without an Effuſion of Blood. He aſſerts that the *Gall-Bladder*, when it is conjoined with the *Liver*, conſiſts only of a ſingle Membrane, but elſewhere it is double.

The *Meatus Cyſticus*, where it terminates in the common Duct, has no Valves, but only a narrow Mouth, to hinder the reflux of the *Bile*.

The *Liver* has three Sinuſes, one in which the *Gall-Bladder* is ſituated, another into which the *Umbilical Vein* enters, and a third where the Trunk of the *Vena Cava* paſſes.

The *Gall-Bladder* has a large Artery, but very ſmall Veins. He ſaid he had obſerved that when the Artery was large, the Vein which anſwered to it was ſmall; *But I do not believe it.*

Opinions of Marchetti, *which to me do not ſeem probable.*

1. He aſſerts likewiſe, that when the *Meatus Cyſticus* is obſtructed, the yellow Jaundice is produced, and when the Porus Cholidochus, the Black.

2. That the Veſſels of the *Vena Portarum* and *Cava* in the *Liver* are not joined together by their Mouths, but by Harmonia, or mutually lying upon one another.

3. That the *Vena Portarum* does not put on a new Membrane within the Subſtance of the *Liver*.

4. That he has ſeen *Lacteal Veins* inſerted into the Trunk of the *Vena Portarum*.

5. That he could never find out nor believe that there was a common *Receptacle* of the *Chyle*. *I know the contrary from my own Experience.*

6. That he had ſeen a conſiderable Branch of the *Lacteal Duct* terminating in the *Pancreas*.

7. That he thought the Uſe of the *Spleen* was to ſeparate the *Black Bile* from the *Blood*, and to tranſmit it together with the *Blood* to the *Liver* by the *Splenick Vein*, whence it was ſent off into the Inteſtines by the *Meatus Cholidochus*.

8. That he imagined the *Lacteal Veins* ſucked the *Chyle* from the *Inteſtines*, and carried it to the *Pancreas*, the Uſe of which was to perfect and exalt it farther, and to throw off the excrementitious Part of it into the Inteſtines by *Virſungius*'s new Veſſel.

9. That he had ſeen *Lacteal Veſſels* upon the *Meſocolon* coming from the *Inteſtines*; which is certainly true. *I have ſeen them myſelf.*

10. That the external *Hæmorrhoidal Veins* did not ariſe from the *Vena Cava*, but were Branches of the *Vena Portarum*. That their ex-

treme Branches perforated the Skin itſelf, and ended in little Tubercles under the Scarf-Skin; and to theſe were applied *Leeches.* The *Hæmorrhoidal Vein* riſes ſometimes from the *Splenick Branch*, ſometimes from the *Meſenterick*, but moſt frequently at the very Diviſion of the *Vena Portarum.* This Vein ſcatters it's Branches all over the *Meſocolon.*

The *Meſocolon* differs from the *Meſentery* in Thinneſs.

Three or four Branches of Arteries pretty large riſing from the *Cæliac*, enter the *Spleen.*

There are ſeveral Branches of the *Splenick Vein*, diſtributed through the whole Subſtance of the *Spleen*, contrary to the Opinion of *Sylvius*, who aſſerts *that their Mouths only open into the Spleen, but they do not at all penetrate it's Subſtance.*

Obſ. When any one dies of a lingering Diſeaſe, the *Spleen* is black; if he dies violently, it is red.

The *New Veſſel* of the *Pancreas*, and the *Porus Cholidochus*, perforate the Duodenum at the ſame Place; ſometimes it enters the Inteſtine by different Foramina, as it happens in Dogs.

He ſhewed us a Plexus of Nerves in the *Meſentery*; *for what Uſe?*

The *Porus Cholidochus* appeared to me to be very large in this Body.

The *Left Kidney* in this, and in all other human Bodies, is larger and higher ſituated than the right, and removed at a greater Diſtance from the Trunk of the *Vena Cava*, whence the Emulgent Veſſels are likewiſe longer on that Side. *He certainly gave a very probable Reaſon for this, becauſe the Liver, by lying upon the right Kidney, both depreſſes it, and at the ſame time hinders it's Growth.*

In the right Side, this Body had two *Emulgent Arteries*; the one entering the Sinus of the *Kidney* at the uſual Place, and the other at it's upper Extremity.

The *Ureters* in this Woman were very large, which he affirms to be common to all Woman, becauſe they are of a moiſter Habit, and void a greater Quantity of Urine.

The right *Glandula Renalis* receives a Vein from the Trunk of the *Vena Cava*, but the left from the *Emulgent.* Theſe *Glands* have a Cavity within. The right one lay upon the Body of the *Kidney.*

The two *Spermatick Arteries* ariſe near one another from the Trunk of the *Aorta* below the *Emulgents.* The left *Spermatick Vein* riſes from the *Emulgent* of the ſame Side, but the other has a double Origin, *viz.* one from the *Emulgent*, and the other from the Trunk of the *Vena Cava*, and theſe two ſoon are united into one.

He affirms that he has ſeen *Lacteal Veins* in pregnant Woman ſcattered upon the *Uterus*; which he conjectures very probably convey that watery Serum in which the Child ſwims, to the Cavity of the *Womb. I have found theſe Lacteal Veins very eaſily in an Ewe with Young.*

The *Meſentery* riſing from the three uppermoſt *Vertebræ* of the *Loins.*

He ſhewed the *Seminal Veſſels*, which deſcend indeed to the *Ovaria* but do not enter their Subſtance, but running over the broad *Ligaments* to the convex ſide of the *Ovarium*, are ſpent partly upon the *Tubes* of the *Uterus*, and partly diſtributed to the *Womb* itſelf.

The *Tubes* of the *Uterus*, placed at each Angle of it's *Fundus*, anſwer to the *Horns* of the *Uterus* in Brutes, and are hollow all along, ſo that you can puſh a Probe from the *Uterus* to the further Extremities of them. Their internal Coat is white, and there is frequently found in them a white ſerous Humour, which is looked upon to be the *Female Seed*.

The *Ovaria*, or *Female Teſticles*, have no *Epididymis*; they are connected at one Extremity by nervous Ligaments to the *Uterus*, and their Subſtance is more ſoft and lax than that of the Male. One of them in this Woman being ulcerated had a Cavity.

That the *Teſticles* neither in Males nor Females conduce nothing towards Generation, he proved by a very remarkable Experiment. He cut off the *Teſticles* of a *Dog* leaving the *Epididymis* of each entire, then he ſhut up a *Bitch* in a Room for three Years, and admitted no *Dog* to go in to her when ſhe was hot, except the one he had caſtrated, who lined her ſeveral Times. In the ſpace of three Years ſhe littered three Times, at one Time ſhe had ſeven Puppies, at another Nine, and at a third Five. After having made this Experiment, he let the Bitch go. He gave us two or three Inſtances more of Caſes parallel to this; one of a *Horſe* he had caſtrated, leaving only one *Epididymis*, who impregnated ſeveral *Mares*, and was extremely ſalacious; another of a *Dog* which his Servant cut in the ſame Manner; and a third of a Countryman, who by *Venereal Buboes* had loſt both his *Teſticles*, the *Epididymis* of one of them only remaining, yet he married a Wife afterwards, and had three Sons by her. He believes therefore that the *Teſticles* ſerve no other Purpoſe than that which *Ariſtotle* aſſigns, *viz. As Weights to hinder the Spermatick Veſſels from intangling with one another*. And indeed the Seminal Veſſels do not terminate in them, nor paſs through them, but only the *Epididymides*.

The Cavity of the *Uterus* is very ſtrait and ſmall, but it's Coat is thicker and firmer than I could have imagined.

The *Round Ligaments* of the *Womb* have no Perforation into the *Uterus*, but anſwer in ſome Meaſure to the *Vaſa Deferentia* in Males.

The *Internal Orifice* of the *Uterus* is ſhut up with a thick viſcid Liquor in time of Pregnancy, *as I have frequently obſerved in Cows*, ſo that nothing can paſs that Way into the *Uterus*: Whence no *Semen* can be thrown at that Time into the *Womb*, and thereby a *Superfœtation* is prevented. He told us however a Story that he had heard of a Woman who lived in the neighbouring Mountains, who three Months after ſhe had born one Child, bore another at the full Time.

The Mouth of the *Womb* reſembles much the Mouth of the *Tench Fiſh*, and it's Body is ſhaped like a Barber's Pot.

The *Vagina* is large and wrinkled within, but in Whores who have been long uſed to frequent *Venery*, theſe Wrinkles are aboliſhed, and it becomes quite ſmooth.

N. B. In this *Vagina* there were a great many Veſſels, (*viz.* Veins and Arteries) ariſing from the Internal *Iliacks* or *Hypogaſtricks*, interwoven into *Plexuſes* and anaſtomoſing with one another, that are ſpread upon it's Surface, and probably with their little Mouths, or Capillary Extremities, open into it's Cavity, and pour into it the Menſtrual Blood; although *Marchetti* aſſerts, that he could never find out the Orifices of theſe Veſſels; and indeed no Wonder. Some of theſe Branches are likewiſe ſpread upon the *Neck* of the *Womb*.

In the *Pudendum* he ſhewed us the *Labia*, and the *Clitoris*, in the upper Angle of the Chink. The *Wings* or *Nymphæ* in it's upper Part, the *Urethra*, or *Meatus Urinarius*, and the *Membranous Circle* which diſtinguiſhes the Pudendum from the *Vagina Uteri*, and which in Virgins is ſhut up by a Membrane called the *Hymen*, except a Foramen in the Middle through which the Menſtrua flow.

In ſuch as have been deflowered too this Circle appears, making the *Pudendum* higher in that Part; but behind at the *Vagina* is more lax and large.

The Direction of the *Vagina* is lower than the internal Orifice of the *Womb*, whence if the *Penis* happens to be too long, it will throw the the *Semen* beyond that Orifice into this *Sinus*, whereby the Woman will not be impregnated.

He ſays that he has obſerved even in pregnant Women the *Uterus* almoſt two Inches thick.

Obſ. 1. The Reaſon why young Women are cured by Coition of that Diſeaſe which with us is called *The Green Sickneſs*, is becauſe the Penis diſtends pretty much the *Vagina*, and by it's Friction unlocks the Orifices of the Veins, and thereby brings down the *Menſtrua* upon them.

2. The Place where Surgeons ought to cut Women that are troubled with the Stone is in the upper Part of the *Vulva* near the *Labia*, by thruſting a Director into the *Urethra*, and cutting upon it through the fleſhy Neck of the Bladder.

3. The *Urachus* in Man (not in a *Fœtus* while it is yet contained in it's Mother's Belly) is not perforated according to *Marchetti*, but ſerves by way of a Ligament to aſſiſt in ſuſpending the *Bladder*.

4. He never found a *Stone* ſticking in the middle of the *Ureter*, but always either near the *Pelvis* of the *Kidney*, or elſe near the *Bladder*.

The 16th of *December*.] He ſhewed us the *Muſcles* of the *Thorax* and firſt thoſe called the *Pectoral*, which ſerve to draw the Arm towards the Breaſt; their Inſertion the ſame as in *Veſlingius*. Then the *Muſculi Serrati antici minores*, ſerving to bring the Shoulder forwards, and placed under the Pectorals, are inſerted into the *Coracoid Proceſs* of the *Scapula* on each Side.

Then the *Muſculi Serrati antici majores*, which ſerves to draw the *Scapula* forwards and downwards, and are inſerted into the Baſis of the Shoulder Blade.

Next the *External Intercoſtals*, which ariſing from the lower Edge of the Rib above, are inſerted into the upper Edge of the Rib below; and then the *Internal Intercoſtals*, which ariſing from the upper Edge of the Rib below, are inſerted into the lower Edge of the Rib above. The Fibres of theſe Muſcles interſect one another obliquely in the form of a St *Andrew's Croſs*: *Viz.* the Fibres of neither of them run perpendicular to the Ribs, but obliquely.

We obſerved the *Mammary Veins* and *Arteries*; the *External*, which ariſe from the Axillaries, and the *Internal*, which ariſe from the Subclavians, and having proceeded ſome way within the Cavity of the *Thorax*, are divided into two Branches, one of which perforates the Muſcles of the *Thorax*, and is beſtowed upon the *Breaſts*; while the other running downwards as far as the middle of the *Rectus Muſcle*, is joined by Anaſtomoſes with the Extremities of the *Epigaſtrick Vein*.

He told us, that he had obſerved the different Capillary Branches of this Vein terminating in ſo many different Tubes of the Breaſts; and further, that he imagined the *Milk* was not produced from the *Chyle*, but from the *Blood*.

The *Subclavian Muſcles*, ariſing from the *Clavicles*, where they are joined with the *Acromion*, are inſerted into the firſt Ribs, where they are connected to the *Sternum*.

We obſerved the Muſcles called the *Sphincter* and *Levatores Ani*, which all have their Origin from the lower Part of the *Os Sacrum*, where it is joined to the *Os Coccygis*.

In *Ulcers* and *Fiſtul* of the *Anus*, Surgeons ought to take Care, that they do not cut the Fibres of the *Sphincter* acroſs, becauſe thereby the Power of retaining the Excrements will be loſt.

The *Cephalick Vein* divides and diſtinguiſhes the Pectoral Muſcles, from thoſe called *Deltoid*.

In the *Neck* we obſerved, firſt the *Platyſma Myoides* fleſhy, *viz.* the fleſhy Membrane abovementioned in this Part, degenerated into a Muſcle, which being fixed to the Chin, bends the Head downwards.

Then the *Maſtoid Muſcles*, as they are called: As alſo the *Digaſtricks*, which perforate the *Stylo-hyoïdæi*, with their middle Tendon.

He ſhewed the Muſcles of the *Os Hyoïdes*, of which there are ſix Pair. 1. The *Sterno-hyoïdæi*. 2. The *Coraco-hyoïdæi*. 3. The *Stylo-cerato-hyoïdæi*. 4. The *Thyreo-hyoïdæi*. 5 and 6. The *Genio-hyoïdæi*, external and internal.

He next diſſected the *Uvula* with it's Muſcles, of which there are two Pair, *viz.* the *Pterigo-Staphylini* external and internal.

He ſhewed the Muſcles of the *Scutiform Cartilage*, of which there are three Pair. 1. The *Sterno-Thyroidæi*. 2. The *Crico-Thyroidæi*. 3. The *Hyo-Thyroidæi*.

The Muſcles of the *Arytænoid Cartilage*, of which there are four Pair. 1. The *Thyreo-Arytenoidæi*. 2. The *Arytenoidæi* or *Sphincter*. 3. The lateral *Crico-Arytenoidæi*. 4. The poſterior *Crico-Arytenoidæi*.

The Muſcles of the *Pharynx*, of which there are three Pair. 1. The *Stylo pharingei.* 2. The *Spheno pharingei.* 3. The *Cephalo pharingei*, which are rather the fleſhy Beginning of the *Œſophagus*, than Muſcles; alſo the Muſcle called *Œſophageus*, which ſhuts up the *Pharynx*.

1. In the *Baſtard Quincy*, the Tonſils are inflamed, and in the *true* one the Muſcles of the Larynx, but eſpecially the *Arytænoidei*.

2. In the *true Quincy* his Father made an Inciſion into the *Larynx*, between it's two uppermoſt Rings, and introduced a Silver Pipe into the Wound, by which the Patient reſpired, and ſo cured it. But the Surgeon ought after having made an Inciſion, to divide a little, and turn aſide as dextrouſly as he can, the *Sterno hyoidei* and *Sterno thyroidei* Muſcles.

3. He told us that he had obſerved a Branch of the *Ductus Thoracicus* or *Chyliferus* going to the Pericardium, and introducing a Pipe into it, he inflated this Bag, whence he rationally conjectures that the Lymph is thereby derived into the *Pericardium*.

4. The Human Lungs viewed externally are pretty much in the Shape of an *Ox's Hoof*.

5. The Branches of the *Windpipe*, or *Bronchia* within the *Lungs*, have no annular Cartilages.

6. The *Valves* of the *Vena Cava*, are called *tricuſpides*; thoſe of the *Pulmonary Vein*, *Mitrales*; becauſe, taken together, they repreſent ſomewhat a Biſhop's Mitre; the *Valves* of the *Pulmonary Artery* are called *Sigmoid*, and theſe of the *Aorta* the *Semilunar*.

The *Pericardium* in this Body was preternaturally connected at it's Point to the *Diaphragm*.

We obſerved a *double Gland* below the *Larynx*, under the *Sterno thyroidei* Muſcles, upon each Side of the *Aſpera Arteria*, which in the *Bronchocele* (*to which the Inhabitants of the Alps and the high Mountains are ſubject*) ſwell to a great Bulk.

He obſerved likewiſe the *Thoracick Duct* ſend one little Branch to the *Parotid Gland*.

The 18th of December,] He diſſected the Muſcles of the Back, viz. 1. The *Trapezius*, or *Cucularis*, ſo called from it's Figure, of which *Veſlingius* has treated at large. The *Rhomboides*, which terminates in the Baſis of the Scapula. 3. The *Levator Scapulæ*, called the Muſcle of Patience, or the poor Man's Muſcle, becauſe poor People, when they are denied an Alms ſhrug up their Shoulders, ſaying, *We muſt have Patience.* 4. The *Latiſſimus Dorſi*, which is inſerted near the Top of the Shoulder-Bone, and from it's Office is alſo called the *Scalptor Ani.* 5. The *Leſſer poſterior Serrati*, which are the higheſt. 6. The *greater poſterior Serrati*, which are the loweſt. 7. The *Longiſſimus Dorſi*, which runs the whole Length of the Back, united at it's Beginning with the *Sacro-Lumbalis*, and gives off two Slips, or nervous Tendons, to each of the Ribs, which decuſſate one another in the Form of a Croſs, viz. the external Slips run upwards, and the internal ones downwards. 8.

The *Sacro-lumbalis*, which, being joined with the preceding Muſcle internally at it's Beginning, is connected to the *ſpinal Proceſſes* of the *Vertebra* as far as thoſe of the *Neck*, giving off likewiſe Slips to each of the Ribs, but the external ones are fleſhy, and not tendinous, like thoſe of the laſt. 6. The Muſcles called *Semiſpinati.*

He ſhewed us beſides, the Muſcles of the Head and Neck; and firſt the *Splenius*, from it's Reſemblance to a *Bullock's Spleen*. It is inſerted into the Occiput, and (which is not obſerved by *Veſlingius*, or other Authors) it ſends a pretty ſtrong Tendon, detached from the reſt of the Muſcles to the tranſverſe Proceſs of the ſecond Vertebra of the Neck. 2. The *Complexus*, ſo called becauſe it ſeems to be compoſed of different Muſcles. 3. The *Rectus Major*, or external. 4. The *Rectus Minor*, or internal, ariſing from the Tubercle of the firſt Vertebra. 5. The *Obliquus ſuperior*. 6. The *Obliquus inferior*. 7 The *Muſculus maſtoideus*. 8. The *Longus*. 9. The *Scalenus*. 10. The *Tranſverſalis*. 11. The *Spinati*, concerning which you muſt conſult the Anatomical Authors. Then the *Muſculus ſacer* and *Quadratus Lumborum.*

He next gave us a View of the Muſcles of the Face. Upon the Fore-head the fleſhy Membrane degenerates into a Muſcle, beginning to grow double at that Part where the Hair ceaſes to grow.

Obſ. 1. Theſe Muſcles which move or draw the Lips from one another obliquely, called *Sardonii*, ought to be cut in that Diſeaſe, which is called the *Riſus ſardonicus.*

2. If the Head is rubbed with the Fat which grows upon the Cranium, it will produce Plenty of Hair.

3. People who die of a malignant Fever, have the Inteſtines after Death livid, or of a greeniſh blue Colour.

4. The *Pericranium* is not different from the *Perioſteum*, only the *Perioſteum* in the Head is called *Pericranium*, and may be divided into ſeveral Layers, v. g. ſeven, or even ten.

5. The *Temporal Muſcles* are covered with a proper Membrane, both for their Defence, and to keep them in their Situation, which ſome have falſely taken for the *Pericranium*. We muſt take Care not to wound this Membrane; becauſe a Wound in it frequently occaſions Convulſions, and hence Wounds here are eſteem'd mortal.

The 19th *of December.*] He diſſected the Muſcles of the Face: of the *Noſe* two, viz. the triangular and oblique: Of the *Eye*, the *Sphincter* of the *Eyelids*: Of the Lips, the *Elevators*, viz. of the *upper Lip*, of which there are two Pair; one riſing from the inner Angle of the *Eye* common to the *Lips* and Noſe. The Muſcles which riſe from the *Os Jugale*, and therefore called *Zygomatici*, ought to be diſſected in the *Riſus ſardonicus*. He obſerved that theſe Muſcles were wanting in ſome Subjects. The *Conſtrictor*, or *Sphincter* Muſcle of the Lips, is by ſome called the *Muſculus baſiatorius*. The *Depreſſors* of the under Lip, ariſing from the Lower Part of the Chin, are very ſpongy on that Part where the Hairs grow. There is another Pair which likewiſe draws the lower Lip downwards, inſerted into the Angles of the *Sphincter*, or of the Mouth.

The Muſcles of the *lower Jaw*, viz. the *Temporal*, *Maſſeter*, external and internal *Pterigoidæi*, all which pull the lower Jaw upwards; then the *Digaſtricks* which depreſs it.

Note 1. In trepanning the Skull, we ought to avoid the Sutures: for if the *Dura Mater* (which is join'd with the Pericranium at the Sutures) is hurt, there is great Danger of the Patient's dying convuls'd.

2. The human Brain is very large, compared with the Bulk of the reſt of the Body.

3. I have obſerv'd in the *Ventricles* of the Brain, two Bodies called *Hippocampi*, or *Sea-Horſes* and *Silk-Worms* by *Arontius*, from their Likeneſs.

4. The *Brain* does not pulſate of itſelf, but only from the Arteries: For if you open the Skull of a living Animal, and lay open the Brain, and on one Part of it remove the *Pia Mater* with the Veſſels running upon it, you will ſee that Part where the Membrane ſtill remains pulſate, and the other Parts where it is taken off free of any Pulſation. He aſſerts, that he has made this Experiment, and that the Brain after the Cranium was remov'd, pulſated more than a Quarter of an Hour.

5. We obſerv'd the *fourth Pair* of Nerves, or *Fallopius*'s, which ariſing from the poſterior Part of the Brain, and creeping by the Sides of it's Baſis, go out near the third Pair.

6. We obſerved ſeveral of the firſt *ſeven Pair* of Nerves not to be ſimple, though they went out at one Foramen, but really divided, and compoſed of ſeveral others, viz. the third and fifth Pair conſiſted each of four Nerves, the ſixth of eight or ten; but all theſe taken together are not ſo large as I would have imagined.

7. The *Glandula Pituitaria* is larger and firmer in Man, than I have uſually obſerv'd it to be in Brutes.

8. Under the Membrane of the *Infundibulum*, he ſhewed us two little white Bodies of the Bigneſs of a Vetch, and of the Figure of the Teſticles, which, he ſays, his Brother firſt diſcovered. *But they are painted by* Veſlingius.

9. In the great Cavities of the Noſe, I obſerv'd four Bodies or more, oblong, ſpongy, and covered with a Membrane, which probably keep the Mucus from running out.

10. The *Pia Mater* ſeems compoſed of the Coats of Veins and Arteries, which are very numerous upon it.

He next diſſected the *Eye*, and ſhewed us ſix Muſcles belonging to it. 1. The *Elevator*, call'd likewiſe the *Superbus*, and *Spaniſh Muſcle*. 2. The *Depreſſors*, *humble* and *Capuchins*. 3. The *Adductors*, *Drunkards* and *German Muſcles*. 4. The *Abductors*, or whoriſh Muſcles. 5. The *Oblique*. 6. The *Trochlearis*, or *Pulley-Muſcle*, called alſo the *Lover*'s Muſcle.

The anterior Part only of the Coat of the Cryſtaline Humour is called the *Aranea* or *Cobweb-coat*, the poſterior Part is call'd *Hyaloidis* or *vitrous*.

He obſerv'd Nerves going into each of the Muſcles; I mean thoſe of the *Eye*.

The *Veſiculæ Seminales* are placed like Wings on each Side of the *Vaſa Deferentia* immediately above the *Proſtate Glands*, and have their Origin or Root near theſe Glands.

Theſe are nothing elſe than the *Vaſa Deferentia* dilated immediately above the *Proſtatæ*.

Whores in Coition have the Art of tightening the *Vagina* by protruding the *Os Occygis* inwards, and thereby increaſing the Pleaſure of Copulation.

The 21ſt of December.] We obſerved on one Side the *ſpermatick Artery*, after riſing pretty low down from the Trunk of the *Great Aorta*, aſcend upwards, and climb over the *Emulgent* of that Side.

We ſaw plainly an Orifice from the *Capſula Seminalis* into the *Urethra*, as alſo into the *Seminal Veſicles*, ſo that a Probe could be eaſily introduced into each of them. That Foramen which terminates in the *Urethra*, has a Valve, by means of a Tubercle in the Neck of the Bladder, or a ſmall Caruncle in the Beginning of the *Urethra*, which hinders the *Semen* from oozing out involuntarily, or from regurgitating into the *Capſule*.

He aſſerts that he never found *Semen* in the *Proſtate* Glands, nor any Foramen by which it could paſs from thence into the *Urethra*. *But I am of another Opinion, and imagine Semen to be contain'd in theſe Glands, even in Men.* He thinks therefore, that theſe Glands were only made to compreſs the Neck of the *Bladder*, and thereby conduce to throw out the *Semen* with ſufficient Force.

Towards the Top of the *Urethra*, viz. near the Extremity of the *Glands*, the Canal dilates itſelf, and forms a little Sinus, in which if there ſtagnates any acrid or putrid Matter, whether it is ſeminal, or Urine, it occaſions ſharp Pains, and produces little Puſtules.

A yellow *Gonorrhœa* occaſions very violent Pain.

He diſſected the *Muſcles* of the *Hand*, which are theſe. 1. The *Deltoid*. 2. The *Coracoid*, ſerving to raiſe up the Arm. 3. The *Rotundus major*. 4. The *Rotundus minor*, which depreſſes the Arm. 5. The *Infra-ſpinatus*. 6. *Supra-ſpinatus*. 7. The *Infra-ſcapularis*. Theſe ſerve to rotate the Arm at the Shoulder. 8. The *Biceps* chiefly remarkable on Account of it's double Origin; one of it's Heads paſſing in a Sinus or Grove in the Head of the Os Humeri, like the String of a Bow at the Nut, and inſerted by it's Tendon into the Head of the *Scapula*. 9. The *Brachiæus*, which bends the Arm. 10. The *long Muſcle*. 11. The *ſhort one*, which unites with the other. 12. The *Anconæus*. Theſe extend the *Cubit*. 13. The *Quadratus*. 14. The *Teres*. Theſe are called Pronators. 15. The *Supinator longus*. 16. The *Supinator brevis*. 17. The Palmaris, which is extended over the whole *Palm* of the *Hand*. 18. The *external Flexor of the Carpus*. 19. The *internal Flexor of the Carpus*. 20. The *external Extenſor of the Carpus*. 21. The *internal Extenſor of the Carpus*. 22. The *Flexors of the firſt Joint of the Fingers*, called *Lumbricales*, ariſing fleſhy from the Tendons of the *Flexors* of the ſecond Joint of the Fingers. 23. The *Flexors* of the ſecond Joint called *Perforati.* 24. The *Flexors* of the third Joint, called *Perforantes.* 25. The *Abductor* of the *little Finger.* 26. Of the *Ring-Finger.* 27. Of the *Middle Finger.* 28. Of the *Fore-Finger*, the *Indicator*, the moſt remarkable of all. 29. The *Adductor* of the Fore-Finger. 30. Of the *Middle Finger.* 31. Of the *Ring Finger.* 32. Of the *little Finger.* Theſe Muſcles are placed between the Fingers in the Form of a Croſs, and are called *Interoſſei.* 33. The *Flexor* of the firſt Joint of the Thumb. 34. The *Flexor* of the ſecond Joint of the Thumb, which may be divided into four diſtinct Muſcles. 35. The *Adductor* of the *Thumb.* 36. The *Abductor* of the Thumb. 37. The *Flexor* of the third Joint of the Thumb. 38. The firſt *Extenſor* of the Thumb. 39. The ſecond *Extenſor* of the Thumb. 40. The *Extenſors* of the Fingers, which as it were ſurround the Joints.

The Operation *of* cutting a Child *out of the* Womb.

The 25th of December.] We ſaw the Operation of cutting a Child out of the Womb, performed in a Carcaſs by *Marchetti* the younger: This is called *Partus Cæſarius.*

He told us, that he himſelf had taken a Child out of the Mother's Womb, after ſhe was dead, which lived two or three Days.

The *Inciſion* is to be made on one Side, taking Care to avoid the *Linea alba* and the Parts near it, upon Account of the Tendons of the Muſcles, which meet all about that Part, and when they are divided very difficultly unite again: and on that Side too where you find the Child's Head to be ſituated.

In making the *Inciſion* you ought to be very cautious, cutting gradually and gently, for fear of wounding the *Inteſtines.* As ſoon as the Surgeon has got fairly through the Muſcles and *Peritonæum*, he ought to thruſt in two of his Fingers, and keep theſe Parts up while he inlarges the Inciſion. In the ſame manner when he opens the Womb. he ought to be very careful not to wound the Child.

As ſoon as the Woman is delivered, the Wound muſt be ſew'd up with a Needle paſſed through all the Muſcles and Membranes; and the Threads ought to be hid at every Stitch. But the Womb itſelf is by no Means to be ſewed.

Having done this, you ought to inject into the Womb a Decoction of *Sanicle*, Confrey, and *other Vulneraries*; as alſo the *rougheſt Wine* you can get. But firſt of all, you muſt apply to the external Wound of the Belly, Linnen Cloths moiſtened with the White of Eggs, and afterwards Plaſters, as *Diapalma*, &c. But if the Wound comes to a Suppuration, you muſt put in a Tent at the lower Part of it,

He told us that he could never obſerve the *Oſſa Pubis* ſeparate in the Time of Labour; for he had laid his Hand upon that Part in the Time of the moſt difficult Births, but could not be ſenſible of the leaſt Disjunction, or Oblongation of theſe Bones. He quoted an Argument taken from *Hippocrates* againſt the Opinion, taken from *a Callus*, which is commonly found on Bones that have been diſlocated, or broke, and hinders the Separation of them for the future.

A Diſſection of a Hare.

The 1ſt of January.] In a Hare diſſected, we obſerv'd the *Inteſtinum Rectum* of a very great Length, having large *Pilulæ* of Dung *ſecundum intervalla.* I call here the Gut (ſo far as it had no *Cellulæ*) *Rectum*, tho' indeed it had one or two Convolutions.

The *Inteſtinum Cæcum* was of a vaſt Bigneſs and Length: In Bigneſs it far exceeded the *Colon*, and was full of Excrement. Juſt at the Entrance into it out of the *Ilium* was another *Appendix* of a globular Figure; the *Tunicæ* of it more fleſhy, and fuller of Veins and Arteries than the adjoining *Cæcum*; there was alſo a little round Hole in it. The *Cæcum* towards the farther End of it was ſmall, round, fleſhy, full of Veſſels, red-colour'd like the *Jejunum* in a Man; the inner *Tunica* granulated, and this for more than 4 Inches in Length.

The *Spleen* was ſmall and long, thicker at one End; it had no *Veſicula Fellea*, that I could find. (*In another we found the* Veſicula Fellea *manifeſtly*) The Kidneys large, and the Left ſituate higher than the Right. The *Glandulæ Renales* receiv'd not their Veſſels from the *Emulgents*, but from great Veins on each Side going to the Loins.

The *Stomach* was full of Graſs (as I conjectur'd) which ſmelt like the Wax of an Honey-comb when the Honey is newly drained from it.

It was a Female, and had long *Cornua Uteri*, but did not *geſtare* when we cut it up.

It ſeem'd to have ſuch a Cavity under the Tail, above the *Foramen Ani*, as I have obſerv'd in a *Badger*.

I believe now, that the Matter contain'd in the *Stomach* was *Fir* chew'd ſmall, the which the Smell argu'd.

A Diſſection of a Mountain-Hen.

The 2d of January.] In a *Mountain Hen* I obſerved two *Appendices cæci* more than half an Ell long. At their Beginning where they riſe from the *Rectum*, after three or four Inches they are reflected or convoluted, but in this firſt Convolution there is no Excrement contained; then they both creep upwards by the Side of the Inteſtines, and are very large and full of Excrement. At their Orifice, where they are joined on to the *Rectum*, they have an annular Kind of Muſcle, or a Sort of *Sphincter*.

The *Liver* was large, and divided chiefly into two Lobes. I could not find any *Gall-Bladder*, but two large *Pori biliari* opening into the *Duodenum* by two diſtinct Orifices not far from one another.

The *Spleen* was ſmall, and triangular. The *Stomach* ſomewhat muſcular, having it's internal Coat in ſome Parts of an horny Hardneſs. The *Heart* was very large.

In the *Stomach* and *Crop* were the Tops and Buds of the Leaves of the *Fir-Tree*, which being opened ſent out a reſinous pleaſant enough Smell, very like that of the Stuff contained in the *Stomach* of the Hare.

Of an unuſual Blackneſs in the Face. By Mr J. Yonge, *n.*323. *p.*435.

II. A Girl 16 Years old, a Daughter of Mrs *Elizabeth Worth* of *Plymouth*, about the End of *April* 1709, had a few hot Pimples roſe on her Cheeks, which Bleeding, and a Purge or two, cur'd. She continu'd very well 'till about a Month afterwards, when her Face, ſo far as is uſually cover'd with a Vizard-Mask, ſuddenly turn'd black like that of a *Negro*. This ſurprizing Accident much frighten'd her, eſpecially after ſome fooliſh People perſwaded her ſhe was bewitch'd, and never to be cur'd: By Prayers, Exorciſms, *&c.* which they uſed, in order to relieve the Faſcination, they increas'd the Paſſion and Terror of Mind to a great Degree, even to Diſtraction, and then deſir'd my Aſſiſtance.

By the Arguments which I uſed, and ſome compoſing anti-hyſterical Remedies, the Violence of her Fits became much pacify'd. I directed a Lotion for her Face, which took off the Diſcoloration; yet it return'd frequently, but with no Regularity, ſometimes twice or thrice in 24 Hours, ſometimes five or ſix times. It appears inſenſibly, without Pain, Sickneſs, or any Symptoms of it's Approach, except a little warm Fluſhing juſt before it appears. It eaſily comes away, and leaves the Skin clear and white, but ſmuts the Cloth that wipes it from the Face; it feels unctuous, and ſeems like Greaſe and Soot, or Blacking mix'd: It has no Taſte at all.

She never had the *Menſes*; is thin, but healthful: The Blackneſs appears no-where but in the prominent Part of her Face. There are a thouſand Eye-Witneſſes to the Truth of this uncommon Caſe.

The anomalar Blackneſs of the Girl's Face is now [*Nov.* 1.] divided into a few dark cloudy Specks; which appear but ſeldom, and nothing ſo livid as formerly. *Ibid.* p. 432.

The Itch *cauſed by* Animalcules. *By Dr* Bonomo. *Communicated by Dr* R. Mead. *n.* 283. *p.* 1296.

III. Having frequently obſerv'd that the poor Women, when their Children are troubled with the *Itch*, do with the Point of a Pin pull out of the ſcabby Skin little Bladders of Water, and crack them like Fleas upon their Nails; and that the Slaves in the *Bagnio* at *Leghorn* do often practiſe this mutual Kindneſs one to another, it came into my Mind to examine what theſe Bladders might be.

Finding an *Itchy* Perſon, I enquir'd of him where he felt the greateſt and moſt acute *Itching*; he pointed to a great many little *Puſtules*, not yet ſcabb'd over, of which picking out one with a very fine Needle, and ſqueezing from it a thin Water, I took out a very ſmall *Globule* ſcarcely diſcernible: Obſerving this with a Microſcope, I found it to be a very minute living Creature, in Shape reſembling a *Tortoiſe*, of a whitiſh Colour, a little dark upon the Back, with ſome thin and long Hairs, of nimble Motion, with ſix Feet, a ſharp Head, with two little Horns at the End of the Snout, as in *Fig.* 127, 128. Fig 127, 128.

I repeated the Search frequently in ſeveral Itchy Perſons of different Age, Complexion, and Sex, and at different Seaſons of the Year, and in all found the ſame Animals, and that in moſt of the watery Puſtules; for now and then, in ſome few, I could not ſee any.

And though, by reaſon of their Minuteneſs, and Colour the ſame with the Skin, 'tis hard to diſcern theſe Creatures upon the Surface of of the Body, nevertheleſs I have ſometimes ſeen them upon the Joints of the Fingers in the little Furrows of the *Cuticula*, where, with their ſharp Head, they firſt begin to enter; and by this gnawing and working in with their Body, they cauſe a moſt troubleſome *Itching*, 'till they are got quite under the *Cuticula*; and then 'tis eaſy to ſee how they make Ways from Place to Place by their biting and eating, one ſingle one happening ſometimes to make ſeveral *Puſtules*, of which I have often found two or three together, and for the moſt Part very near to one another.

With great Earneſtneſs I examined whether or no theſe *Animalcules* laid Eggs; and after many Enquiries, while I was drawing the Figure of one of them by a Microſcope, from the hinder Part I ſaw drop a very ſmall, and ſcarcely viſible, white Egg, almoſt tranſparent, and oblong, like to the Seed of a Pine-apple, *Fig.* 129, 130. Fig. 129. 130.

I oftentimes found theſe Eggs afterwards, from which no doubt theſe Creatures are generated, as all others are, that is, from a Male and Female, tho' I have not yet been able, by any Difference of Figure to diſtinguiſh the Sex of theſe Animals.

From this Diſcovery I conclude the *Itch* to be nothing elſe, but the continual biting of theſe *Animalcules* in the Skin, by means of which ſome Portion of the *Serum* ouzing out thro' the ſmall Apertures of the *Cutis*, little watery Bladders are made, within which the Inſects continuing to gnaw, the infected are forced to ſcratch, and by ſcratching increaſe the Miſchief, breaking not only the little Puſtules, but the Skin too, and ſome little Blood Veſſels; and ſo making Scabs, cruſty Sores, and ſuch like filthy Symptoms.

From hence we come to underſtand how the *Itch* proves to be a Diſtemper ſo very catching; ſince theſe Creatures by ſimple Contact can eaſily paſs from one Body to another, their Motion being wonderfully ſwift; and they as well crawling upon the Surface of the Body as under the *Cuticula*, being very apt to ſtick to every thing that touches them, and a very few of them being once lodged, they multiply apace by the Eggs which they lay.

Neither is it any Wonder if this Infection be propagated by the means of Sheets, Towels, Handkerchiefs, Gloves, &c. uſed by *Itchy* Perſons; it being eaſy enough for ſome of theſe Creepers to be lodged in ſuch Things as thoſe; and indeed I have obſerved, that they will live out of the Body 2 or 3 Days.

Nor ſhall we be at a Loſs to know the Reaſon of the Cure of it by Lixivial Waſhes, Baths, and Ointments made up of Salts, Sulphurs, Vitriols, Mercuries, ſimple, præcipitate or ſublimate, and ſuch ſort of corroſive and penetrating Medicines. Theſe being infallibly powerful to kill the Vermin lodged in the Cavities of the Skin; which ſcratching will never do, partly by reaſon of their Hardneſs, and partly becauſe they are ſo minute as ſcarcely to be found by the Nails.

Neither do inward Medicines perform any real Service in this Caſe, it being always neceſſary after a tedious Uſe of theſe to have Recourſe to thoſe external ones already mentioned. And if in Practice we oftentimes experience, that this Diſeaſe, when we think it is quite cured by Unction, does nevertheleſs in a ſhort time return again, this is not ſtrange; ſince tho' the Ointment may have kill'd all the living Creatures, yet it may not probably have deſtroy'd all their Eggs, laid as it were in the Neſts of the Skin, from which they may afterwards breed again, and renew the Diſtemper. And upon this Account it is very adviſable after the Cure is perform'd, ſtill to continue the Anointing for a Day or two more; which it is the eaſier to do, becauſe theſe Liniments may be made agreeable enough, and of a good Smell, as particularly is that compounded of the Ointment of *Orange Flowers* or *Roſes*, and a ſmall Quantity of *Red Præcipitate*.

IV. *Accounts of Books omitted.*

1. *Bibliographiæ Anatomicæ Specimen*, ſive Catalogus omnium pene Auctorum qui ab *Hippocrate* ad *Harveium* Rem Anatomicam ex profeſſo vel obiter ſcriptis illuſtrarunt, Cura et Studio *Jacobi Douglas*, M. D. Reg. Soc. S. & in Coll. Chirurg. *Lond.* Prælect. Anatom. 8*vo*, *Londini* 1715. n.343. p.263.
2. *Hippocratis Aphoriſmi* cum Commentariolo, Auctore *Martino Liſter* è Medicis ſereniſſimæ Majeſtatis Reginæ *Annæ*, *Londini* 1703. n. 284. p. 1373.
3. *Sanctorii Sanctorii* de *Statica Medicina*. Aphoriſmorum Sectiones ſeptem cum Commentario *Martini Liſter*, 8vo, *Londini* 1701. n.270. p.822.

CHAP. III.

The HEAD.

An Experiment *to diſcover the* Cauſe *of the* Motion *of the* Dura Mater. *by Dr* H. Ridley, *n* 287. *p* 1480.

I. UPON reading a new Opinion ſtarted by *Baglivi* (in his *Specimen* conſiſting of four Books *de Fibra Motrice*) concerning the Pulſatory Motion of the *Dura Mater*, which is evident to the Eye in Wounds of the Brain, or upon laying it open in living Animals, I thought it my Buſineſs, without regarding thoſe Arguments which agree with his Hypotheſis (which perhaps are ſtill true, although this Membrane ſhould borrow it's Motion ſomewhere elſe, I mean not have it of itſelf) to examine again carefully what I had ſaid upon this Affair.

Let us ſee then, beſides what he advances in ſeveral other Parts of his Book, what this famous Author ſays, p. 20. where are theſe Words: *Upon ſeeing which Boy, I immediately began to ſuſpect, that thoſe ſtrong* *and regular Motions of the* Dura Mater, *are not owing to the Arteries which are ſcattered upon it, but to it's own proper Texture, which vies even with that of the Heart itſelf*; as a little before he had called it *the Heart of the Brain.* Afterwards, p. 29. he has the following, *Wherefore the Cauſe of the Pulſation of the* Dura Mater, *is in the whole Membrane, and in it's proper Subſtance, nor is it to be looked for any where elſe.*

Allow me now to quote what follows from *my own* Book, cap. 6.

A great many of the Ancients, and alſo ſome of the Moderns, eſpecially Willis *and* Vieuſſens, *finding a Pulſation in theſe Sinuſes, after the Manner of the Arteries, attributed it to the Arteries which terminate in them. But being a little doubtful of the Truth of this Aſſertion, to put an End to the Controverſy, I tried the following Experiment. Having tied a Dog and fixed him properly, I took away a ſufficient Portion of the Skull, but we could not obſerve the leaſt Pulſation neither of the Dura Mater, nor of the Longitudinal Sinus; but after a little while, from the above Sinus, which was accidentally opened by Means of an hot Iron, which was deſigned for another Purpoſe, a violent Efflux of Blood following, after the Veſſels were conſiderably emptied, the Blood began to flow out by Jerks, with a very obſervable Pulſation both of the Sinus and of the whole Membrane. I laid open the Sinus (though in vain) it's whole Length, to try if I could find out, by the ſpurting Stream of the Blood, the Inſertion of ſome of the Arteries, ſeveral of which both* Vieuſſens *and* Wepfer *ſaid they had ſeen inſerted into it.*

This ſeems ſufficient to demonſtrate, contrary to the Opinion of Bourdon, *that there is no other Motion in theſe Sinuſes, except that which is communicated both to them and the* Dura Mater, *by the Arteries which are diſperſed through the whole Subſtance of the Brain, (aſſiſted, as I imagine, by the Concurrence of thoſe which are diſtributed to the Membrane itſelf) as* Fallopius, Volch. Coïter, *and others formerly aſſerted.*

To make the Thing ſtill more evident, I tried the following Experiment:

I trepann'd the upper Part of the *Parietal* Bone of a Dog, and laid bare the *Dura Mater*, not without ſome Loſs of Blood. The Hæmorrhage being immediately ſtopped with Lint, and the Blood wiped clean off, there appeared a pulſatory Motion of that Membrane, and of the longitudinal Sinus, which ran by the Border of the *Foramen* made by the Trepan, exactly reſembling the Vibrations of the Heart, which were quicker than uſual, and quite correſponding with it in the Number of Vibrations.

Some Perſons who were along with me viewed this Vibration for a Quarter of an Hour; after which I tried to lay hold of the Membrane with a Hook, that ſo by raiſing it up, and elevating it with a Knife, I might examine ſufficiently the Motion of the Brain below. Having made the Perforation (which the Dog ſeemed to feel very ſenſibly, but without any Sort of Convulſion) there followed an Hæmorrhage as before, which was likewiſe very ſoon ſtopp'd.

The Blood being waſhed away, at that particular *Foramen* made by the Puncture of the Hook in the Membrane, appeared the pulſatory Motion of the Brain, puſhing outwards a ſmall Clot of Blood that ſtuck in it.

Afterwards introducing the blunt Point of a Pair of Forceps into the Opening of the wounded Membrane, I cut it acroſs in that Part which was moſt remote from the *Sinus*, upon which the Brain covered with the *Pia Mater* protruded itſelf through the Aperture, the Motion ſtill continuing pretty ſtrong to the Touch, although the Membrane itſelf, upon Account of the Elaſticity of it's Fibres being diminiſhed by the Wound, appeared to vibrate more obſcurely to the Sight.

All this while the Dog continued ſtrong, only he had *Tremors*, with a Kind of Horror all over his Body.

After ſome Hours taken up in obſerving theſe Appearances, during which the Dog was tortured with various Symptoms, and had loſt a great deal of Blood, at laſt, to take away all the pulſatory Force, which can be ſuppoſed either in itſelf, or ſupplied ſomewhere elſe upon Account of it's Fibres; (of which I have given a faithful Deſcription in the firſt Chapter of the Book above quoted, and by means of which it increaſes that Motion firſt communicated by the Brain) I rubbed gently upon it a few Drops of the *Oil of Vitriol*; whereby it was tinged of a black Colour. Hence there was no Vibration to be perceived, or at leaſt very little; but notwithſtanding it being thus rendered unfit to yield to the Impulſe of the Brain, yet upon touching it with the Finger you could feel the Pulſation of the Brain diſtinctly enough.

After all this, the Dog continuing ſtill in Spirits, upon introducing the Point of a Knife about an Inch into the Brain, he ſtruggled very hard, and was taken with violent Convulſions both of his Body and Limbs; at which Time having put my Finger as formerly into the above Aperture, I could feel the Brain move ſtronger than before. Afterwards I puſhed a Spatula deeper into the Brain, which occaſioned Symptoms of the moſt violent Pain. At laſt, upon puſhing the Inſtrument to the oppoſite Side of the *Cranium*, the Animal was thrown into terrible Convulſions; and now, that all Doubt concerning the Motion of the Brain might be removed, both I and the By-ſtanders, puſhing our Fingers in as before, could feel it's *Syſtole* and *Diaſtole* acting with great Force. Now I cannot ſee what can be deſired more towards diſcovering the true and genuine Firſt Cauſe of this Motion, provided the *Phænomena* which occur in this Experiment be carefully attend- to.

But that I may not ſeem deficient in other Authorities, out of a great many Obſervations, I ſhall ſubjoin the following inſtead of all the reſt, you will find it in the *Miſc. Curioſ. German.* Decur. 2. An. 4. *of the Year* 1685, Obſ. 129. by *Theod. Moeren*; which runs thus:

This great Contuſion had broke both the Dura *and* Pia Mater, *had contunded the very Subſtance of the Brain, and the Blood had made it's Way* *into the glandular Cavities of the Brain, which I wiped off gently with a Probe armed with ſoft Silk; and having cleanſed the Wound, after applying proper Medicines both externally and internally, I bound up the Head.*

But I was ſurprized at it every Day: For by the continual Pulſation of the Brain, there was protruded a fungous Subſtance, which I was obliged to dreſs twice a Day, and though I had a very proper Pair of Sciſſars for cutting it off, yet I could not help ſometimes occaſioning an Hæmorrhage, which obliged me to put my Probe as far down as the Canthus *of the Eye, in order to clear the Blood from the Cavities of the Brain, which otherwiſe by ſtagnating would have produced more grievous Symptoms.*

I ſaw a Caſe formerly very like this, and it was dreſſed every Day for a long while by a very able Surgeon.

As to the Office aſſigned to this Membrane by *Baglivi*, *viz.* that by compreſſing more cloſely the *Cortex* of the Brain, the animal Spirits are produced in greater Plenty, and diſtributed to the more remote nervous Parts of the Body.

In the firſt Place I would obſerve, what a vaſt Number of Branches the *Carotid Arteries*, when they arrive at the Brain, diſtribute through all it's Subſtance both Cortical and Medullary; ſo that according to *Malpighius*, they bear the Proportion of one Third to all the other Arteries in the whole Body; which Aſſertion I found not much ſtretched beyond the Truth, upon comparing them with the other Arteries, after having filled them all with Wax.

Secondly, the inverted Situation of the *Cortex* of the *Medulla Spinalis* (where we muſt likewiſe neceſſarily allow a conſtant Secretion and Diſtribution of the animal Spirits) being placed on the Inſide, and the Medullary Part where the Nerves eſcape without. The Application is very plain.

A Bone *taken from the* Falx, *&c. by Mr.* Cheſelden. *n.*337. *p.* 281. Fig. 131.

II. *Fig.* 131, ſhews a Bone taken from the *Falx*, or firſt Proceſs of the *Dura Mater*, of a Man who died of violent Head-Aches.

The Optic Nerve waſted, *by the ſame*, ib. Fig. 132.

III. *Fig.* 132, ſhews the *Optick Nerves*; the Right Nerve being waſted and diſcoloured: both the Eyes appear'd to be very good. I had not an Opportunity of enquiring into the Caſe of this Perſon; but I ſuppoſe it muſt have been a *Gutta Serena*.

Of a Remarkable Fracture *of the* Skull, *by Mr* C. Amijand, *n.*317. *p.*173.

IV. We had laſt Campaign a Soldier in the Hoſpital at *Ghent*, who had receiv'd a remarkable Fracture of the *Skull*; it was in the interior Part of the *Squamoſe* Bone, and occaſion'd by a Splinter of a Fellow-Soldier's Piece burſting, that ſtruck him there. Some Time had paſs'd, before the Accidents made us ſuſpect a Fracture, and oblig'd us to make a triangular Inciſion upon the *Temporal* Muſcle; a Fiſſure was diſcover'd, which indicated the Neceſſity of the Trepan. It was apply'd twice, the firſt not making Room ſufficient to extract a large

Piece of the internal Table, very much depreſs'd. After this, all the Accidents diſappear'd; but twelve Days after the Operation, Rigors, cold Sweats, an intermitting Pulſe, and ſome other Signs of an approaching Death, made us deſpair of his Recovery. He died the 15th Day from the Operation, and the 20th from his Wound. His Skull was open'd, and in it 3 very remarkable Fiſſures were obſerv'd: The firſt had, notwithſtanding the *Sagittal* Suture, croſs'd from one *Parietal* Bone to the other, as far as the *Coronal* Suture on that Side oppoſite to the Wound; another had gone croſs the *Coronal* Bone; and the third was on the *Parietal* Bone, on the Side of the Wound, pretty near the *Sutura Squamoſa*; but what is moſt ſingular, is, that none of theſe Fiſſures did reach that upon which the Trepan had been apply'd. An *Empyema* was found in the *Thorax*, and a conſiderable *Impoſthume* in the Liver.

An Account of a Muſket Bullet *coming out of the* Head *of Dr* R. Fielding *near* Thirty *Years after. Written by* himſelf. *n.* 320. *p.* 317.

V. At the firſt *Newberry* Fight, in the Time of the late Civil Wars, the Doctor was ſhot by the Right Eye on the *Os Petroſum*, by the Orbit of the Eye to the Skull, which was likewiſe broke, with great Effuſion of Blood from the Wound, Mouth, and Noſtrils.

The Surgeon carefully probing the Wound for the Diſcovery of the Bullet, but failing of his Intention, on the third Day after the Shot, plac'd him horizontal to the Sun; by which Means depreſſing the broken Skull with the Probe, he could ſee the Palpitation of the Brain, but could not diſcover the Bullet.

When the Doctor began to grow cold, his Mouth cloſed up, and ſo continued for the Space of half a Year, till many Fractures of Bones were come out of the Wound, Mouth, and Noſtrils; and afterwards whenſoever a Scale of Bone was to come out, his Mouth would cloſe, inſomuch that ſeveral Years after he prognoſticated to ſome Friends, that a Bone was then coming out, which continued ſo for ſix or ſeven Weeks, at which Time finding an Itching in the Orifice of the Wound, with his Finger he felt a Bone; upon which he made known to ſome Friends then preſent, that they ſhould ſee him open his Mouth, and taking out a Bone no bigger than a Pin's Head, he immediately open'd his Mouth.

At the ſecond *Newberry* Fight it heal'd up, no Art could keep it open. After this, for the Space of ten Years, or more, a Flux of ſanious Matter iſſued out of the Right Noſtril, and then ceaſing there, it flow'd from the Left Noſtril for ſome Years: At length, for the Space of two Years, or thereabouts, upon Riding, the Doctor would ſometimes find a Pain on the Left Side, about the Almonds of the Ear, which he attributed to Cold, but more eſpecially after riding in a cold dark Night, which occaſion'd a Kind of Deafneſs too; and having ſtopp'd his Ear with Wool to recover his Hearing, one Day, either Writing or Reading, ſuddenly an Huff came in the Ear, which made him ſtart, and in the Manner not to be expreſs'd, unleſs you can imagine a *Vacuum*; this happen'd about *March* or *April* 70. Upon this all that Side of the Cheek hung looſe, as tho' paralytick, and under the Ear might be felt a hard Knob.

After this, Tumour upon Tumour appear'd on that Side under the Jaw-Bone, which occaſion'd his conſulting ſome Phyſicians, two at one Time, one of which ſuſpected the Bullet, which, conſidering the Shot, they thought not credible. At length the Tumors coming to the Throat, if he held up his Head a little, it ſeemed as if one with a Hook did pull down the Jaw-Bone, and if any thing touch'd the Throat, it was as painful as if prick'd with a Handful of Needles; being at laſt perſuaded to make ſome Applications, a ſmall Hole appeared, after that another; and a third Part near the *Pomum Adami*; by theſe the Bullet was diſcover'd, and cut out in *Auguſt* 1672.

Obſervations on the Structure *of the* Ear, *by Dr* A. Adams. *n.*311 *p.*2415.

VI. The bony Cavity of the *Ear* is covered at each End by a *Membrane*; the former is call'd the Membrane of the *Drum*, and the other is directly oppoſite to it; the outer is ſtronger than the inner. They are join'd together by the Handle of the *Malleus* adhering to the outer, and the upper Part of the *Stirrup* to the inner, which, by the Intervention of the *Incus* and the *Orbicular* Bone, make a Chain; and they ſeem to be acted and re-acted by theſe ſmall Bones reciprocally.

Whether Artiſts had any Reſpect to this Original when they firſt deviſed *Drums*, I cannot ſay; but nothing can more nearly repreſent the Natural than the Artificial does; the Skins of this anſwering to the Membranes of that, the wooden Cylinder to the bony Cavity: The Sound of the Drum would be flat, without a Hole in the Side, and Nature has given a Paſſage from the Palate to the Ear. The Skins of the Drum would leſſen the Sound, if they were not kept on the Stretch; ſo would thoſe of the other flag, if the Handle of the Hammer and the Stirrup keep them not on the Tenſe.

This inner Membrane is cloſely ſtretch'd before the Labyrinth, the *Foramen rotundum*, and the Paſſage into the *Cochlea*, (I omit the *Foramen Ovale*, becauſe the Foot of the Stirrup exactly ſhuts it) that ſo the Sound may be the bigger upon it's Approach to the Nerves. The Stirrup is generally broke in diſſecting the Ear, particularly that Cover which goes over the Bone on each Side; but if it be carefully open'd, the Stirrup is intirely cover'd with a Membrane, which forms a Cavity flatly Oval, and the Inſide is excavated.

Obſervations on Inciſions *of the* Cornea, *by Dr* Gandolphe. *n* 322. *p* 387.

VII. Contuſions upon the Bodies of Animals do not always make the greateſt Impreſſion on the Parts that immediately receive them; an Inſtance of which I had in a Blow on the Eye, in *April* 1709.

There was a light Contuſion on the Outſide of the Part, with very little Alteration to Appearance; but a Veſſel being broken within, pour'd forth a conſiderable Quantity of Blood: The Eye alſo loſt it's Tranſparency, and almoſt it's Sight, which was ſo very weak, that it could ſcarce perceive the greateſt Light when objected to it. The *Cornea* appear'd all over red, but without any Inflammation or Blood-Veſſels, it receiving it's Colour from the Blood pour'd in upon the *Aqueous Humour*.

I ſaw the Patient the 6th Day after he had receiv'd the Hurt: He had been let Blood thrice; and the 8th Day I cauſed the *Cornea* to be open'd near the Middle; my Deſign being to make a large Orifice, I determined not to make it at the Bottom of the *Cornea*. The Orifice being made, there came forth ſome Drops of the *Aqueous Humour* mix'd with Blood. The *Cornea* ſtill appear'd as red as before, and was not ſo even as we could have wiſh'd. This Circumſtance made me reſolve to make a ſecond Orifice immediately, as large as the former, but lower: There run out ſome Drops of the *Humour*, and the Eye appear'd not ſo red and convex as before. The *Huomur* continued coming out of the Orifice for ſome Time. We apply'd nothing to the Eye but a Compreſs, or Stupe, dipp'd in a Mixture of four Ounces of Plantain Water, and two Ounces of a Vulnerary Water.

The Day after the Operation, the upper Part of the *Cornea* was tranſparent, the lower Part not ſo red, and the whole Membrane appear'd to have recover'd it's natural Convexity. It ſeems that all the extravaſated Blood had quite run out, had the lower Part of the *Cornea* been open'd, and remain'd ſo for ſome Time.

I obſerv'd the Alterations of the Eye for three Days together; in which Time the extravaſated Blood ſeemed ſometimes to ſpread over the whole Cavity of the *Cornea*.

We judg'd that the Motion that the Patient himſelf might have uſed, had opened anew ſome Blood-Veſſel, or had mix'd the extravaſated Blood with the *Aqueous Humour*; for we did not perceive all that Time that there was any freſh Effuſion of more Blood.

The 5th Day after the two firſt Inciſions I cauſed a third to be made at the Bottom of the *Cornea*: There run out ſome Drops of the *Humour*, and continu'd ſo to do for ſome Time; and in two Days after, the Eye recover'd it's natural Tranſparency.

The *Pupil* was now very much dilated; but by little and little it contracted again, but not to it's uſual Smallneſs.

The *Iris* all this while kept it's Motion, ſo that we cannot ſuſpect that the Lancette, in making the Inciſion on the *Cornea*, any ways touch'd upon the *Iris*, becauſe the *Pupil* continued exactly round; and a Stroke that is able to divide the Continuity of the Parts of the Eye, and cauſe a Suffuſion of Blood, is but too capable of depriving the *Iris* of it's natural Power of contracting.

The *Pupil*, which before the Blow was one Line in Diameter when the *Iris* was contracted, is at leaſt two Lines in Diameter at preſent. The Tranſparency of the *Humours*, and Convexity of the *Cornea*, are the ſame as before.

The Sight is now reſtored, and there remains no other Alteration than what neceſſarily follows from the like Dilatation of the *Pupil.*

From hence we may draw ſome Remarks, that will be of Uſe in Practice, and ſhew that Inciſions may be ſucceſsfully made on the *Cornea.*

1. Inciſions are made on this Part without any Pain.

2. The Orifices unite again without any Scar; which has been before obſerved, but is known to very few.

3. We find that Plants of a diſcuſſive Quality have an ill Effect, the Patient finding himſelf much worſe after uſing a Cataplaſm, made of *Chervil* and *Parſley:* Theſe Plants, which are excellent in reſolving extravaſated Blood in Muſcular Parts, have an ill Effect when applied to the Eye, by cauſing Pain, and rendering the Sight more diſturb'd. We had twice Experience of this; and the Patient aſſured us both Times, that he found himſelf much better from the Uſe of the firſt Medicine.

When there is a conſiderable Effuſion of Blood in the Eye in couching of a Cataract, and no Orifice is made in the *Cornea* to let it out, it may ſo alter the Tranſparency of the *Vitreous Humour*, as to cauſe a Loſs of Sight, which ſometimes follows from this Operation.

I made the Inciſion higher on the *Cornea* than it ought to be, becauſe the Perſon that performed the Operation, having never before made the like, and deſiring to make an Orifice large enough to diſcharge eaſily the *Aqueous Humour*, I thought it proper to make it near the Middle of the *Cornea*, that the Point of the Lancette might not touch upon the *Iris*; which would have been of much worſe Conſequence than a Scar. The Effuſion of Blood, that ſometimes happens in couching of Cataracts, is diſcuſſed again, either by external Applications, or the Help of Nature; but when the Effuſion is very conſiderable, this Operation may be neceſſary to prevent worſe Conſequences.

As for the Scar, that ſometimes follows from an Inciſion of the *Cornea*, I remember I have read in an antient Author, that we need not fear it: but if we practiſe Inciſions on Eyes affected with Inflammations, Ulcers, or Defluxions, which very much dilate the *Retina* and Veſſels, an Eſcar forms itſelf much more eaſily in theſe Caſes, and conſequently we ought to uſe the greater Caution; which was not ſo neceſſary in my Patient, who had no kind of Inflammation on the Eye or *Cornea.*

An uncommon Kind of Convulſions; *by Dr* J. Freind. n.270 p.799.

VIII. Laſt Summer, in the Year 1700, there was a frequent Rumour at *Blackthorn* in *Oxfordſhire*, about ſome young Girls who were ſeized with Barkings like Dogs. This Plague infeſted two Families, to one of which Dr *Willis* went on Purpoſe, to inform himſelf of the Truth of an Affair ſo unuſual, and he communicated the Caſe to me juſt as he ſaw it; and here I give it you in his own Words.

As ſoon as I entered *Blackthorn*, my Ears were ſtunn'd with a terrible Howling at a Diſtance, but upon going into the Houſe where the Girls were, the Noiſe that they made being nearer, was quite horrible, anſwering one another by Turns, with a violent Motion of the Head, and a Kind of Nodding, like the Town Piper, making a very ungrateful Diſcord. Their Faces were not convulſed, only they had frequent gaping Motions of the Mouth, and the Pulſe was like that of a Perſon in Health, only towards the End it became a little weaker. The Noiſe they made, as I thought, did not ſo much reſemble the Barking as the Howling of Dogs, except that it was more frequent, and interrupted with Hiccups. This new canine Diſeaſe paid no Regard to the different Ages of thoſe five Girls which I ſaw, but attacked them all alike, from ſix till fifteen. Frequently between whiles they talked very ſenſibly; and ſometimes one of them beginning the Fray, rouſed all the reſt, like a Pack of Hounds. At length the Spirits being quite exhauſted, they were ſeized with a Kind of Epileptick Fit, and fell down upon a Bed that was laid on Purpoſe for them in the Middle of the Room, where they lay very cloſe to one another, like Siſters, and for a little while ſlept very ſound. Preſently they were ſeized again with new Convulſions; they began all to beat their Breaſts, and toſs about their Limbs, and be troubleſome to one another. Two of the youngeſt of them, while I ſtaid there, awoke, ſhook off their morbid Sleep, and left their Siſters a-bed: But nevertheleſs they were taken with the ſame Howling with the others, and almoſt the ſame Motions of the Head.

Being ſtruck with ſuch an extraordinary Account, I thought it well worth the while to go and ſee the Thing myſelf; I therefore went to *Blackthorn* the 12th of *June* 1700, and viſited the other Family labouring under the ſame Complaint. And here I ſaw one Son and three little Daughters of the ſame Mother, who had been ill of Convulſions upwards of ten Weeks, without any other Diſeaſe, or any ſenſible Cauſe preceding it. At firſt one of the Girls only was taken ill, and the firſt Fit held her for about two Hours. The reſt, together with the Brother, as the Mother told me, were ſo grieved and frightened at their Siſter's Complaint, that in a few Days they alſo were ſeized with Convulſions. When I went there they were all at play free from their Convulſions, and this Reſpite they had chearfully enjoyed more than Half an Hour, which was a great Relief to them, having wiſhed in vain for an Interval for ſeveral Weeks before. Their Complexion was healthy enough, they ſpoke chearfully, were all very lively, had very good Limbs, and the free Uſe of them; nor did there appear any Marks of the bad Effects of this Diſeaſe, except a little Weakneſs and Torpor, the Pulſe very good, both as to Strength and Regularity. At laſt the eldeſt Girl, about fourteen Years of Age, was taken with Convulſions as uſual. She felt only one Sign of the Fit's coming on, *viz.* a Swelling, as it were, of the Stomach, which climbing gradually up to the *Fauces*, in Form of a Lump, gave Warning to the Muſcles of the Head, and *Larynx* to begin their uſual Convulſions. The ſame Symptom

tom was a certain Fore-runner of the *Paroxyſm* in all of them, and if they attempted to prevent or quiet it, the Fit was thereby rendered both longer and more violent. The Sound which they inceſſantly and very diſagreeably modulated, did not (as was reported) reſemble altogether the Barking or Howling of a Dog, but rather ſeemed as it were a very unuſual Kind of Tune compoſed of three Numbers, or Notes twice repeated, interrupted with a ſhort Sigh, and cloſed at laſt with a ſingle Note, which was a great deal ſtronger and more acute than the others. It is impoſſible for me to expreſs to the Life this doleful Sing-Song; it is of that Kind which can only be remembered by ſuch as have good Ears, but cannot be deſcribed. However, ſhe ſung this imperfect Song of her's almoſt without Intermiſſion; for ſometimes ſhe varied the Notes by Turns, and ſometimes when ſhe was out of Breath, both the Motion and Vociferation became more frequent, till at laſt being almoſt ſuffocated, ſhe would ſtop for a Note or two, and hold ſtill her Head a little, and by this means having recovered a little Breath, ſhe would begin anew again her old Sing-Song. This was always accompanied with a reciprocal Nodding of the Head ſtrait backwards and forwards, but never moving it obliquely or in a ſemi-circular Manner. The Muſcles of the Neck were very tenſe and inflated; the other Parts of the Body were free of Convulſions. But when theſe Fits were upon her, ſhe was ſcarce able to bend her Legs, neither according to her Inclination, nor as ſhe was ordered: For during the whole *Paroxyſm*, ſhe continued quite ſenſible, and would either ſit down or walk about as ſhe was ordered, but had it not in her Power to utter a ſingle Word. The Colour of her Face was no Way altered, her Eyes were fixed like thoſe of a dead Perſon, but no Diſtortions any where except in her Mouth, which from the Contractions of the Muſcles there, was juſt like that of a Dog. While the *Paroxyſm* laſted, there was hardly any Pulſe at all to be felt. She continued in theſe Agitations more than Half an Hour; and in this Condition, Night approaching, obliged me to leave her. Her Brother and Siſters, though they were ſtanding by her all the while, continued free of Convulſions, contrary to Cuſtom.

They ſleep tolerably at Nights, provided they happen to be ſleepy at Bed-time; if otherwiſe, the *Paroxyſms* continue till the Morning, with as ſhort Intervals as in the Day-time.

The Girls of the other Family were attacked with this Diſeaſe at the new Year; at which Time their Chaps were out of Order, and ſwelled. Soon after theſe which I viſited were ſeized with Convulſions, the others were taken with Epileptick Fits, attended with the Loſs of their Senſes; ſometimes they beat their Breaſts like diſtracted People, and ſometimes run about as if they were ſtung with Bees, *&c.* none of which Symptoms they perceived for the firſt three Months, but were only troubled with thoſe which I deſcribed above.

This extraordinary Complaint of theſe Children put their Mother upon conſulting of Quacks; from which finding no Relief, ſhe was firmly perſuaded that it was owing to Witchcraft, and therefore would not call any Perſon of Skill.

But neither the Strangeneſs, nor the long Duration of the Symptoms, hinders this Diſeaſe I have deſcribed from being natural, ſeeing the Nature of theſe Spaſms agrees with that of all other Convulſions, being owing to the animal Spirits producing Diſturbances in the Nerves, and ſo occaſioning various Contractions of the Muſcles, according to what is common in every Convulſion. So that in this Caſe Nature does nothing uncommon, nor produces any thing more monſtrous than in other Kinds of Convulſions; for ſhe uſes organick Motions as mechanically in this Caſe, as in the *Chorea Sancti Viti*, or in thoſe hyſterick Affections, where the Patient now laughs, now cries, and beats the Breaſt violently without being ſenſible of it. As therefore the Action of the Muſcles, whether of the *Larynx* and Head, or of the Hands and Feet, is exactly the ſame, and they have the ſame Aptitude to Spaſmodick Contractions, whatever may appear to be new or ſtrange in the Complaints of theſe Girls, that is to be attributed not ſo much to the Nature of the Symptom, as to the Part which happens to be affected, and though an Inſtance very rarely occurs of it's being convulſed in the above Manner, yet we ſhall be leſs doubtful of the Poſſibility of ſuch a Thing happening, if *Willis*'s Obſervation has any Weight with us; *viz.* that in Children, who are not yet accuſtomed to Exerciſes of the Limbs, or Affections of the Heart, the Spaſmodick Matter is more frequently derived into the Nerves next to theſe, that is, into thoſe of the third, fifth, and ſixth Pair, wherefore in them the Face and Mouth chiefly are convulſed.

The Parents in theſe two Families were firſt Couſins to one another, whether their Nearneſs of Blood was the Occaſion, why the other Family which remained well for ſome Months after the firſt, was at laſt taken ill of almoſt the ſame Complaints, I leave to thoſe who are ſtudious of Sympathies and the Horoſcope.

IX. We had, in 1702, an Epidemical Fever, attended with very ſurprizing Symptoms; in the Beginning the Patient was frequently attack'd with the *Colica Ventriculi*; Convulſions in various Parts, ſometimes violent Vomitings, and a Deſentery; the Jaundice; and in many of them a Suppreſſion of Urine; and what Urine was made, was highly ſaturated with Choler: About the State of the Diſtemper, large purple Spots appear'd, and on each Side of 'em two large Bliſters, which continu'd 3 or 4 Days: theſe Bliſters were ſo plac'd about the Spots, that they might in ſome meaſure be term'd Satellites or Tenders: Of theſe, there were in many four different Irruptions; but the moſt remarkable Inſtance I ſaw in this Fever, was in a poor Boy of *Lymm* in *Cheſhire*, one *John Pownell*, about 13 Years of Age, who was afflicted with the following Symptoms upon the Criſis or Turn of the Fever, he was ſeiz'd with an *Aphonia*, and was ſpeechleſs ſix Weeks, with the follow-

An Account of ſtrange Epileptic Fits, *by Dr* C. Leigh. *n.*280.*p.*1174.

ing Convulſions; the Diſtemper infeſted the Nerves of both Arms and Legs, which produc'd the *Chorea Sancti Viti*, or St *Vitus*'s Dance; the Legs ſometimes were both ſo contracted, that no Perſon could reduce them to their natural Poſition; beſides theſe, he had moſt terrible Symptoms, which began in the following manner; he could perceive the Fits to come on about the *Os Sacrum*, or Extremity of the Back-bone, and the Region of the Navel, and then the Diſorder, as he imagined, united about the Top of his Head; he immediately afterwards fell into violent Convulſions in the Abdomen or loweſt Cavity, with that Violence, that ſometimes two or three Perſons were forc'd to lie upon him, to keep him in Bed, his Body being frequently rais'd from it; after this, the Nerves of the Lungs were immediately affected, and then he barked in all the uſual Notes of a Dog, ſometimes Snarling, Barking, and at the laſt Howling like an Hound; after this the Nerves of the Mandibles were convuls'd, and then the Jaws claſh'd together with that Violence, that ſeveral of his Teeth were beaten out, and then at ſeveral times there came a great Foam from his Mouth; afterwards he had an extreme wild Look, ſnatching at any Thing near him, and would have tore off his Fleſh, had he not been prevented by the Perſons about him; This made me conjecture he might formerly have been bit by a mad Dog, which had introduced the *Hydrophobia*; but I was convinc'd to the contrary, for I put a Baſon of Water by him, and he was not in the leaſt afraid of it, nor attempted to lap it. I ſaw him in three of theſe Fits; but at other times in theſe Convulſions, he roar'd like a Bull, made a Noiſe like a Hog, and ſometimes like that of a Goſling; all which differing Sounds, (I take it) proceed from the different Contractions of the Lungs, variouſly forcing out the Air, and conſequently as they were differently convuls'd, form various Sounds. In a Week's time I recovered the Boy his Speech, his Senſes return'd, his Convulſions vaniſh'd, and the Boy is now very chearful: there have been other Perſons in this Country much after the ſame Manner.

A Caſe, *wherein from an* Obſtruction *of the* Left Ventricle *of the* Brain, *the* Nerves *on the* oppoſite *Side were* affected; *by Dr* A. Adams. *n.* 313. *p.* 40.

X. Some time ago I open'd the Head of a Woman who died of an Apoplexy, and in the left Ventricle of the Brain, I found betwixt 4 and 5 Ounces of clotted Blood; and in the right Ventricle there was no Blood at all, but every Thing as uſual; and all the Nerves which commanded the right Side of the Body were as ſtrong as any I ever obſerv'd in a ſound Animal, eſpecially in their Origin, and, as far as I could trace them, in their Courſe. It was my Opinion, that, whichever Ventricle the Obſtruction was in, the Nerves and Muſcles correſponding to that Side were affected: but here the contrary plainly appear'd; for tho' the Obſtruction was in the left Ventricle, yet the Senſe and Motion of the right Side were entirely loſt, and the ſmall Remains of either were obſervable in the left Side.

XI.

XI. *Accounts of Books omitted.*

1. *Diſſertatio* Epiſtolaris de *Glandulis* Conglobatis *Duræ Meningis* humanæ, indeque ortis *Lymphaticis* ad *Piam Meningem* productis. Auctore *Antonis Pacchiono.* Romæ 1705. 8vo. *n.*328. *p.*208.

2. *Conſilium Ætiologicum* De *Caſu* quodam *Epileptico*: Quo reſpondetur Epiſtolæ Doctiſſimi Viri *Thomæ Hobart*, M. D. Annexa Diſquiſitione de *Perſpirationis Inſenſibilis* Materia & Peragendæ ratione. Authore *Gulielmo Cole*, M. D. Coll. Med. *Lond.* Socio, 8vo. n. 287. p. 1485.

3. *De Aure Humana* Tractatus; in quo integra Auris Fabrica, multis novis Inventis & Iconiſmis illuſtrata deſcribitur; omniumque; ejus Partium Uſus indigantur. Quibus interpoſita eſt Muſculorum *Uvulæ*, atque *Pharyngis* nova Deſcriptio & Delineatio. Auctore *Antonio, Maria, Valſalva, Imolenſi*, Philoſophiæ & Medicinæ Doctore, in *Bononienſi* Univerſitate ad Inciſionem & Oſtenſionem Anatomicam Profeſſore Conducto, nec non Noſocomii Incurabilium Chirurgo. *Bononiæ.* MDCCIV. Quarto. n. 299. p. 1978.

Dr *Douglas*, who gives an Account of this Book, remarks, that Mr *Cowper*'s Account of the *Muſcles* of the Ear is more accurate; and that the Author has wholly omitted the moſt conſiderable Part of Mr *Cowper*'s *Muſculus Pterigopharyngæus*, which riſes from the *Proceſſus Pterigoides*, deſcribing only the lower Part of it, which ſprings from the *Tongue*, and the *Os Hyoides*, which he makes to be two Pair of diſtinct Muſcles.

CHAP. IV.

The Neck, The Thorax, The Heart.

A Large Tumour *in the* Neck, *with* a Boney *Subſtance*; *by Dr* J. Douglas, *n.* 305. *p.* 2214.

I. I Lately had the Opportunity of opening a Woman, about 50 Years old, who had a large Tumour, or hard Swelling, in the fore-part of her Neck, poſſeſſing all the Space between the whole Extent of the lower Jaw and the upper Part of the *Sternum*, with a conſiderable Riſing in it's Middle; laterally in it's Point inclining to the left Side tho' the biggeſt Part of the Tumour was on the Right. The Skin on the *Apex* of this protuberating Part was thin and ſhrivell'd, of a Colour different from the reſt, and look'd as if the Swelling would have broke in that Place.

The Skin was exceeding thin, having no Fat under it, only in a Cavity between two Lobes, to be afterwards deſcrib'd, on it's Right-ſide, there was a ſmall Appearance of ſome; for the Skin being leſs ſtretch'd there, the Cells of the *Membrana adipoſa* were not quite empty'd.

The fleſhy Fibres of the *Latiſſimus colli* were ſcarce viſible.

The *Maſtoidæus* and *Coraco-hyoides* were extremely thin, and in their Aſcent they adhered very firm to the ſudjacent Tumour.

The *Sterno-hyoidæus* and the *Sterno-thyroidæus*, that run up the fore-part of this Swelling, were diſtended ſo thin, that it was difficult to ſeparate them from it, eſpecially the laſt.

The right Carotid Artery, in it's Aſcent to the Head, ran along it's outer Edge, which increaſing, did much obſtruct the Current of the Blood that way.

The Internal *Jugular*, the *Par Vagum*, and the intercoſtal Pair went alſo over ſome Part of this Swelling in their Deſcent to the *Thorax*. Two of the Lymphatick Glands of the *Jugular* Vein were ſwelled to the Bigneſs of little Eggs, being plac'd at ſome Diſtance one from another, with a Hollow between, where ſome Fat was found; theſe two Lobes made the Tumour very uneven alſo on it's right Side.

Theſe Muſcles, the *Jugular*, with the two Glands adhering to it, and the reſt of the forenam'd Veſſels being removed on both Sides, I could eaſily obſerve the Bigneſs, the Figure, and the Circumſcription or Limits of this preternatural Tumour, with all it's Adheſions to the adjacents Parts.

In Magnitude it ſeemed to exceed that of two Fiſts joined together.

It's Figure was almoſt Triangular, with a broad Baſis under the Chin ſloping a little on each Side, as it deſcended to the upper Part of the *Sternum*, where it's Point was pretty narrow; it's Surface was made uneven, by three Riſings, of which the largeſt was turn'd to the left Side; the other two being placed on the Right, as above remarked.

It adhered by Membranous Filaments to the *Maxillar* Glands, to the *Digaſtrick* Muſcle, and to the *Stilohyoidæus*; under which, on the right Side, a ſmall Portion of it, in the Form of a Nipple, did intrude itſelf as it were under the Tongue; in the upper and fore-part it alſo adhered to the *Os Hyoides*.

Laterally it was connected to the *Levator Scapulæ*, and lower down to that Part of the *Cucullaris* that terminates into the *Clavicle*, backwards to all the fore-part of the *Aſperia Arteria*, between it's third or fourth Cartilaginous Ring and the *Os Pectoris*, as alſo to that Muſcle of the Head called *Rectus Internus major*, and to ſome part of the *Scaleni*; it's lower Part was engaged under the *Jugulum*, or lunated Part of the Breaſt-bone, to which it adhered.

It was eaſily freed from it's Connections to all theſe different Parts, but not ſo from the *Glandulæ Thyroidææ* to which it adhered after a far different Manner; for where the *Thyroidal* Glands are joined to one another, a little below the *Cartilago Crycoides*, on the fore-part of the rough Artery, there was no ſeparating of it without cutting it's Subſtance; whence it plainly appears, that the Union of theſe Glands was the Root or Beginning of this exceſſive Tumour: and yet, which is very remarkable, the Glands themſelves kept their uſual Figure, and were no larger than ordinary.

This Tumour was hard and very firm, being exactly of the Conſiſtence of a Cow's Udder when boiled, yet in a few Places it was ſoftiſh, containing a liquid and thick Juice.

It's Colour was chiefly of a whitiſh Yellow, only in ſome Places it was exceeding Red, from it's having a greater Store of Blood-Veſſels, and in others it was very White.

Hearing the Edge of my Knife grate againſt ſomething hard, while I was cutting it, I proceeded with Caution; and pared off all the ſoft Part, and the hard Subſtance that remained I boiled, and then cleared it very well, having left ſticking to it at one Corner a ſoft Cartilaginous Body, which poſſibly had the Patient liv'd longer, would have acquired the ſame Degree of Induration. It very much reſembles a Peice of white unpoliſh'd Rock Coral; but whether it may be reckoned oſſeous, or if it be rather the Viſcid Humour of the Glands harden'd and concreted into this irregular Chalky or Gravelly Subſtance, I leave to others to determine. Fig. 133.

I remember about two Years ago, I found in the *Proſtrates* of a very old Man a great many hard Bones, like white Peas, being of a Subſtance exactly like this, only ſmoother on the Outſide; ſome of theſe were in the Body of theſe Glands, others adhered by ſmall Roots to the Muſcular Membrane that inveſts them. Fig. 134.

The firſt Appearance of this large Swelling was about twenty Years ago, caus'd by the breaking of a Vein (as the Woman uſed to expreſs it) in a hard and very difficult Labour. It increaſed but very ſlowly, not arriving to any conſiderable Bulk 'till a few Years before ſhe died; it was never very painful, being a true Schirrus: Many Things by ſeveral Perſons had been uſed and applied unſucceſsfully. It's Bigneſs at length became very troubleſome, in impeding her Swallowing and free Breathing, and at laſt it quite choaked her, by compreſſing the Wind-pipe, upon which it lay.

But beſides this, I obſerv'd another remarkable Accident, which did much haſten her End, being very painful and troubleſome for a Year or two before ſhe died.

The *Uterus* was entirely ſchirrous, and diſtended to that Degree that it filled up the whole Capacity of the *Pelvis*. Part of the *Colon* and *Ilion* adhered ſo firmly to it, that there could be no Separation without tearing: Both the *Ovaria* and the *Tubæ* grew cloſe to it; and indeed the Confuſion and Mixture of all theſe Parts was ſo great, that if the *Ovaries* had not been ſwelled here and there with Hydatidal Tumours, I could not have diſtinguiſhed them.

The Neck of the Womb was preſſed down ſo low, that upon a very gentle Dilatation of the *Labia* it offered itſelf to view, being extreamly hard, but yet ſmooth and even, and ſo cloſely ſhut, that I could paſs nothing without cutting.

It had ſqueez'd with the *Veſica Urinaria* ſo cloſe againſt the *Os Pubis* that it could contain but little or no Urine, which obliged her to make it often, and with Pain.

The Preſſure of this Part backwards was ſo great upon the *Inteſtinum Rectum*, that the Evacuation of *Fæces* had been obſtructed for the Space of five Weeks before ſhe died.

There was obſerved to come away *per Anum* for ſome conſiderable time a great deal of *Pus* and ſlimy Matter, but that proceeded from the *Uterus*; for the Acrimonious Humour, which was wont to be diſcharged *per Vaginam*, having been pent up within it's Cavity, by the cloſe Conſtriction of the *Collum Uteri*, had corroded, and eat it's way through the Subſtance in the Womb into the *Rectum*, by which it had it's Vent; which Caſe I have more than once obſerv'd in Diſſection.

The Thickneſs of the Womb was near 2 Inches, and in it's Bottom there was a great deal of this Humour, white and thick, which upon touching, made the Ends of my Fingers white and rough, by ſhrivelling the *Cuticula*, as if I had waſhed them with a ſtrong Solution of ſome Acrid Lixivial Salt. Thus the Cauſtick Salt lodged in Soap affects the Hands of thoſe Women that waſh Linnen. It was very hard to take the *Uterus* out of the *Pelvis*, by reaſon of it's ſo cloſe Adheſion to the neighbouring Parts.

The *Fæces Alvinæ*, contained in the Guts, were but few, by reaſon ſhe could not ſwallow any thing ſolid for a long time, but very hard, and in ſeveral diſtinct Clots.

A Tumour *on the* Neck *full of* Hydatides, *by* Mr A. Hewnden. *n.*308.*p.*2344.

II. A Gentleman in *London*, aged 25 Years, had a large Wenny Tumour, the *Baſis* taking it's Origin from all the lower hinder Part of the *Skull*, ſtretching down the Neck near each *Jugular*, extending itſelf almoſt as low as both *Scapula's*; on the upper Part was a *Phlegmon*. The *Radix* being ſo large, I put on a Tranſverſe Cauſtic the Length and Breadth of the Tumour, intending to ſeparate the *Cutis* from the Membrane of the *Cyſtis*; but it's being ſo thin where the *Phlegmon* was, obliged me to divide the *Cyſtis*; out of which I ſav'd above 60 *Hydatides*, of the Bigneſs of a ſmall Wallnut; ſeveral more were broke. Theſe *Hydatides* ſwam in a Liquor of the Conſiſtence of the Whites of Eggs. In this *Cyſtis* I found a large Quantity of *Atheromatous* and *Steatomatous* Matter, at the *Baſis* a large *Sarcoma*; the greateſt part I cut off, but fearing to hurt the Muſcles of the Neck, deferred it to the next Dreſſing, intending to take the reſt of the *Sarcoma*, and *Radix* of the *Cyſtis* away by Cauſtical Medicines, which I applied without Succeſs, they coming off without making any Eſcar, the *Radix* being of a cartilaginous Subſtance: ſearching with my Probe to find ſome Interſtice, it dropt into one; and touching ſome Membranous or Nervous Body, it caus'd the Patient to cry out furiouſly; into which Interſtice I put a Peice of *Roman Vitriol*, fitted for the Place, which came out the next Day all diſſolv'd, with ſome of the *Radix*: By the continual applying of the Vitriol, I extirpated the whole *Radix*, and heal'd it.

I have two things more to obſerve, That ſeven Years before this Operation, This Tumour was near as big, and ſubſided of itſelf: And that when I began with Cauſtical Medicines, the firſt I uſed was *Præcip. Rub.* with which I cover'd the whole *Radix*, which came off, and no Eſcar, but it ſalivated the Patient for five Weeks.

An Account of a Strange Cancer, *by Mr* J. Kay. *n.* 277. *p.* 1069.

III. My Father's *Cancer* took it's Riſe from a ſmall Bruiſe on the *Os Jugale*, and in Proceſs of Time ſpread itſelf over the whole Cheek; and notwithſtanding the Endeavours of the moſt eminent Surgeons in thoſe Parts where he lived, it ulcerated his Eye round, which I ſaw him take out with his own hand; and afterwards extended itſelf to his Ear, and through his Cheek into his Mouth, and acroſs the upper Part of his Noſe, and perforated the Bone there: It likewiſe over-ran that Side of his Forehead, fouling the *Os Frontis*, which came away in Pieces, leaving the *Dura Mater* bare as broad as a Half-Crown; which riſing through the Perforation of the *Cranium*, in a few Days putrified and expoſed the Brain itſelf, and ſeveral Portions of it came away freſh and untainted; and that which is moſt ſtrange, he perfectly retained his Senſes, and roſe every Day to dreſs the Ulcer himſelf, 'till a conſiderable Quantity of the Brain was come away; and when he was confined to his Bed, his Speech firſt failed, and he died about 4 Days after, his Brain being totally conſumed, and nothing remaining in the *Cranium* but a ſmall Quantity of black putrid Matter: He had neither *Spaſmus* nor Convulſions of any Part all the time of his Illneſs. I was but young when he died, and this, to the beſt of my Remembrance, is the Sum of all.

An extraordinary Wen *cut off the* Cheek, *&c. Communicated by Dr* T. Bower. *n.* 354. *p.* 713.

IV. *Alexander Palmer*, of the Pariſh of *Keith*, in the County of *Bamff*, in the North of *Scotland*, now about fifty-four Years of Age, obſerv'd, when about twenty-ſeven, a little hard Swelling in the Muſcle of the Lower Jaw on the left Side, without any Hurt or manifeſt Occaſion, which at firſt went on ſlowly, but afterwards it proceeded more quickly, and the older it grew, it ſtill came on the faſter; until it increaſed to a prodigious Bulk and Weight: From the firſt Appearance of this Tumour, to the total Exciſion of it, there were about twenty-ſeven Years. He had exceſſive Pains and Uneaſineſs in it, and at laſt it mightily extenuated and emaciated him, who was otherwiſe a ſtrong and robuſt Man.

This Excreſcence was of the natural Colour of the Skin, and ſeem'd to be an *Atheroma*, being a glandulous Subſtance with ſeveral big Blood-Veſſels in it, and had Hair growing on it, as in other Parts of the Body, as may yet be ſeen. It was almoſt round, and very hard, and was as ſenſible as any other Part of the Body; for when the poor Man was working in the Fields, ſome ſix or ſeven Years ago, he accidentally made a great Gaſh or Wound in it with a ſharp Iron, which was very painful, but was cured by a Surgeon, after the manner of an ordinary Wound: the Cicatrice is ſtill to be ſeen in it.

This Excreſcence having grown ſo big, was attach'd to the Muſcle under the Left Eye, called *Obliquus minor* or *inferior*, to the Ear and it's Muſcles, and to the Muſcles of the lower Jaw, named *Deprimens*.

By reaſon of it's great Bulk and Weight, it could not hang down freely without ſome Support, therefore it reſted on the Top of the Shoulder, which made a conſiderable Dimple in it, that is yet very obſervable; beſides it was holden up by the Man's Hand in the Day-time, and laid on his Pillow in the Night-Seaſon.

Some three or four Days before the total Exciſion was made, the Patient obſerved this Tumour begin to mortify at the lower End, which made him ſo uneaſy, that he took a Knife and cut off a good Part of it. This occaſioned a great Hæmorrhage: ſo that he reckon'd there was loſt a *Scots* Pint, or four Pounds of Blood, before it could be ſtopt. The Patient, after ſo great Trouble and Pain, at laſt applied himſelf to Mr *Gordon*, Surgeon of the Place, who made a total Extirpation of it, on the 19th of *January* 1717.

He made a cloſe Ligature, taking in the *Baſis* of the Excreſcence, and all the looſe Skin, and contracting it as much as poſſible, he cut it entirely off with a ſharp Razor. There guſhed out of the Excreſcence, after it was cut off, and was lying on the Ground, as near as could be gueſs'd, two Pounds of Blood; for it was nouriſh'd by ſeveral large Blood-Veſſels, perhaps by ſome Branches of the Carotid Artery much enlarged, and other Blood-Veſſels coming from the Ear, and the Muſcles of the Eye and lower Jaw abovementioned. When Mr *Gordon* brought it to us, which was full three Months after it was cut off, we cut off with a Knife about a quarter of an Inch broad of the Baſis of it; and in that ſmall Space we obſerved four big Blood-Veſſels. The Baſis, as it now appears, is five Inches Diameter, which ſeems too large for the whole Side of the Face: ſo after the Exſection, I think the looſe Skin was turn'd backwards, which may make the Baſis now appear ſo big.

After all this Blood was loſt, the Excreſcence was weighed, and was full nineteen Pound Weight; ſo that before his own Inciſion and this Operation, it ought to have been ſeveral Pounds heavier, which is a moſt prodigious Weight to be depending on ſuch a Place. This Tumour was of a Spheroidical Figure, and when meaſured, was thirty-four Inches about by the longeſt Way, and twenty-eight by the broadeſt.

The Hæmorrhage, which was great, was ſtopped by the Vitriolic Powders and other Aſtringents, and the ordinary Dreſſing was uſed. So this great Cure was compleated in ſix Weeks time, and the Patient entirely recovered, and goes about his Buſineſs, to the great Aſtoniſhment of every Body. The Lid of his Left Eye continues ſtill downwards a little, as does that ſame Side of the Mouth, which was occaſion'd by the great Weight depending on that Side of the Face; but it may be expected they may come again to their right Poſture; for the Head, at firſt after cutting, enclined much to the Right-ſide, by reaſon of the great Weight on the Left Cheek having been removed; but it now begins to ſtand upright, ſince he is perfectly recovered. Tho' the Skin, and even a deal of the muſculous Part of the Cheek and lower Jaw, was cut away, yet Mr *Gordon* (from whom I had this Account) informs me, that it is grown up again, and is of the ordinary Colour of the Skin, and like the other Side of the Face; ſo that there grows Hair on that ſide of the Face as well as on the other, which he ordinarily ſhaves, and this is as ſurprizing as any thing in the whole Affair.

The Excreſcence is preſerv'd among the Rarieties of the College of Phyſicians at *Edinburgh*.

A Schirrous *Tumour in the* Breaſt; *by Mr* T. Greenhill. *n.* 300. *p.* 2009.

V. Mr *J. D.* was ſuppoſed to die of a Conſumption; foraſmuch as 14 Months before he had been violently ſeiz'd with an Inflammation of his Lungs, accompanied with a ſharp Fever, Difficulty of Breathing, Cough, acute Stitches, and Pleuritick Pains, with a Spitting of Blood, *&c.*

He was bled largely in the Beginning, and often repeated it during his Sickneſs; continually taking ſuch proper Remedies as were preſcrib'd him: But notwithſtanding, about *Eaſter* there appear'd a Tumour on the Breaſt-bone, Pap, and Pectoral Muſcle of the Left Side, with a Fulneſs under the *Axilla*; from whence there was conjectur'd to be a Collection of purulent Matter in the Cavity of the *Thorax*, and that the *Sternum* was foul. The firſt from the aforeſaid Tumour, and his ſpitting a bloody and purulent Matter, and the latter from the Riſing and Inequality of that Part. But opening him the third Day after Death, I found his Caſe very different and ſurpriſing, which ſeveral judicious Perſons that attended him in his Sickneſs, and were preſent when he was opened, can teſtify. For ſo ſoon as I had divided and remov'd the common Teguments of the *Thorax*, I found inſtead of a riſing of the Bone with Carioſity, only an oblong Tumour, about four Fingers in Length, and two in Breadth, and a proportionate Thickneſs, weighing 3 Ounces: It extended itſelf perpendicularly on the Superficies of that Part of the *Sternum* which joins with the *Cartilago Enſiformis*. I ſeparated it with my Knife eaſily from the Breaſt-Bone, and found it to be of that Sort of Wens, or enciſted Tumours, called *Atheroma*, containing a pappy Subſtance like ſodden Barley. Next appear'd a very large Tumour on the Left Side of the *Thorax*, covering the whole Pap and Pectoral Muſcles forwards, with a Fullneſs under the *Axilla* of the ſame Arm. Then opening the *Thorax*, I found the ſame Tumour comprehending the Intercoſtals, *Deltoides*, *Subclavian*, and *Subſcapulary* Muſcles, and the whole Axillary and Mamillary Glands, which being obſtructed, and it's Veſſels replete with a creamy pappy Matter, more thick and white than the former, there was produc'd ſuch an Induration of the aforeſaid Glands and Muſcles, which compoſe the upper Part of the Breaſt, that it may more properly be eſteem'd a Schirrus.

The ſame Tumour on the Outſide of the Breaſt was ſomewhat bigger than one's Hand, extending itſelf from the Clavicle to the lower Part of the Pap; and laterally from the Baſis of the Muſcle quite under the Arm-pit. Internally it poſſeſs'd a third Part of the Cavity of the Breaſt, crouding the Left Lobe of the Lungs to the Right Side and in it's upper Part firmly growing to it; which it likewiſe did every

Way to the Intercoſtal Muſcles. It was about the Bigneſs of a Penny-Loaf; and the whole Tumour being conſider'd together, might reaſonably be allow'd to weigh between 3 and 4 Pounds, which being cut into there ouzed out of it, like an expreſſed Sponge, a great Quantity of thick, white, and pappy Matter: And, what is more particularly remarkable, there was form'd a large Sink or *Pelvis*, in the middle of the Axillary Gland, which contain'd a thinner and diſcolour'd Matter, and had a free Communication to the Veſſels of the Lungs in the upper Part of it, where I ſaid before it was united; and from hence it was that he generally found Eaſe when he had ſomewhat emptied it by large Expectorations, and that he could ſo exactly perceive, when any thin Rheums or Matter flow'd to the Part: and as it were here only that the Lungs were black, and replete with ſtagnated Blood, and ſome Globules of the aforeſaid Matter in it's *Veſiculæ*. The reſt of the Lungs were pretty clear from any Ulcers or Matter, but of a ſublivid Colour, and ſtrictly adhered on both Sides to the *Pleura*, but particularly on the left Side, all about the Schirrous Tumour. The *Gall-Bladder* was full of Stones, of the Bigneſs of a Runcival Pea, and conſiſted moſt of odd Angles, and were formed of a thick viſcous Sediment of Gall (which we found in it) from an Obſtruction of it's Veſſels, or Jaundice, which he had ſome Years before: They were in Number 22, ſome triangular, quadrangular, quincunial, &c.

There was nothing elſe remarkable, except a *Maraſmus* of the external Parts, and the Emptineſs of all the *Viſcera* and Blood Veſſels in general.

A Schirrous Tumour, *included in a* Cyſtis *in the* Breaſt; *by Mr* R. Ruſſell. *n.*337. *p.*276.

VI. *Auguſt* 18, 1713. I was ſent for to Mrs *Smith*, who had been reduced very low by a Fever, which, from her Cough, ſharp Pain under her Breaſt, and other Symptoms, was judged Pleuritick.

But upon having a Diſcharge from her painful Breaſt of a thin Gleet, all Symptoms vaniſhed.

When I ſaw her firſt, the Liquor diſcharg'd by a ſmall Pin-hole, near the *Papilla*, was little more than would have wet a Handkerchief four times double.

Examining of the Breaſt, I found a large Tumour, that lay deep, yeilding to my Fingers, and paſting like Dough.

I ſearch'd the Abſceſs with my Probe, and twiſted out with it a Matter like Sawduſt, or Bran, mixed with Hair.

Upon laying open the Breaſt, I ſeparated a Cyſtick Tumour, which weighed eight Ounces, and contain'd a ſolid Matter like the abovementioned, mix'd with a Body like Hair.

Upon enquiring into the manner of it's coming, ſhe told me, that eight and thirty Years ago, ſhe receiv'd a Bruiſe in that Breaſt by a Fall from a Horſe, which was attended with great Pain and Fluxion; inſomuch that the Veins of her Breaſt appear'd varicous and turgid, as in a Cancer; but her Pain ceaſing, they ſunk, and left an indolent Tumour in her Breaſt, ſuppoſed by her Surgeon to be a true *Schirrus*:

Since which time it hath always continued nearly in the ſame State, without Pain, increaſing very little in Magnitude, but obſtructed in ſuch a manner that ſhe could not nurſe her Child with that Breaſt.

The *Tunick* was pretty thick, nouriſhed with very ſmall Veſſels, but had form'd a *Scbirrus* of the Glands it adhered to, by keeping up a Diſtenſion of Parts, 'till there was a Coheſion of their Membranes and Veſſels.

I make no doubt, but this was a Body of diſeaſed Glands, which had ſuffer'd a Colliquation by ſome extravaſated Fluid, and that the Membrane of the Tumour was their proper *Tunick*.

After this manner all our tunicated Tumours ſeem to be form'd; for when an Obſtruction proceeds to Extravaſation, there is a Liquor pour'd out which conſiſts of ſuch Particles, that by Degrees make a Colliquation of the glandulous Fleſh, which is not very ſenſible of Pain; and by Degrees the *Capſula* becomes diſtended with a Matter of a very different Conſiſtence, which gives the Name to the Tumour, either *Steatoma*, *Atheroma*, or *Meliceris*.

Thus pour Oil of Olive on Spirit of Nitre, and your Oil firſt becomes a little hardened, then of the Colour and Conſiſtence of Marrow, 'till by degrees it is hardened into a white Fat, reſembling that of Animals.

The Poſſibility of this Colliquation and Digeſtion we may the eaſier be induced to believe, if we conſider how often we find the Glands of the *Viſcera* petrified, without any Degree of Pain, or the Membrane in any meaſure deſtroy'd.

VII. I took a *Polypus* out of a Child of about a Year old. It's firſt obſervable Diſorders were a quick Pulſe, and a Difficulty of Breathing. In about four Days the Gums were obſerved to be ſwell'd for which they were cut, and all Symptoms diſappeared for five or ſix Hours, after which they return'd. Notwithſtanding Blood-letting, and the Application of other Remedies, the Difficulty of Breathing increas'd the Pulſe became ſtill lower and quicker, and in four Days more the Child died.

A Polypus in the Vena Pulmonalis: *and the Structure of that Veſſel; by Mr* Wm. Cowper. *n.* 270. *p.* 797.

The Body was open'd, and the *Viſcera* of the lower Belly were found well conſtituted.

In the *Thorax* the *Thymus* exceeded the natural Size even in Children. The Fore-part of the Lungs appear'd to be well diſpos'd, but the Back-parts were very hard, and much inflam'd. Making Inciſion on the diſeas'd Part, purulent Matter follow'd the Knife in ſuch quantity from divers Cells, that it filled the Wounds as faſt as made, and Pieces cut from it ſunk in Water. But as we approach'd nearer to the Parts naffected, the Pieces became gradually more buoyant, till at length we ame to the Fore-part, which floated.

The Cavities of the right Auricle and Ventricle of the Heart were fill'd with a *Polypus*, which was continu'd into the ſuperior and inferior Trunk of the *Vena Cava*.

Opening the *Vena Pulmonalis* at the *Baſis* of the Heart, I found it there completely fill'd with a *Polypus*, (or Coagulation of Blood) which

Fig. 135.

was continu'd into all the large Branches of it in the Lungs, and were eaſily drawn out.

The Structure of the Vena Pulmonalis.

This *Polypus* affords us a better Idea of the Contrivance and Structure of the pulmonary Vein, than any Figures of that Veſſel yet publiſhed: For tho' in different Subjects of the ſame Species, we meet with frequent Varieties in the Diſtribution of the Blood-Veſſels, eſpecially of the Veins; we no where find a more conſtant Regularity and Uniformity than in the Trunks and large Branches of the Pulmonary Vein; of which I have added two Figures, drawn after a Preparation of that Vein injected with Wax, and freed from the Lungs of an adult Human Body.

Fig. 136, 137.

This Trunk of the Pulmonary Vein is overlook'd by *Bidloo*, unleſs he may be allow'd to call it the left Ventricle of the Heart, as he has done *Tab.* 22. *Fig.* 7. A.

Fig. 136, 137. The Trunk of this Vein is very ill expreſs'd in the XXXth Table of *Kerckringius*'s Anatomical Obſervations.

The Left Auricle of the Heart (*Fig.* 136, 137.) in Human Bodies being much leſs than the Right, it was neceſſary that the Part of this Vein next the Baſis of the Heart ſhould be very large, (*ibid.* AAB) leſt the ſudden ſtrong Motion of the *Syſtole* ſhould cauſe the refluent Blood to recoil in the Branches of this Vein, (*ibid.* DDEE) and prevent a ready Supply in the ſucceeding *Diaſtole* of the Heart. But the Weight of ſo much Blood lying in the Trunk of this Veſſel, (*ibid.* AAB) does effectually prevent it's Retroceſſion in the lateral Branches within the Lungs; (*ibid.* DDEE) and the more, becauſe the Orifices of thoſe Branches (*ibid.* DD) are not diametrically oppoſite (at AA, *Fig. ibid.*) to the Mouth of the Veſſel on the Baſis of the Heart, (*ibid.* B) it's lateral Branches making acute Angles with the Trunk, as repreſented *Fig.* 136.

A Diſſection *of a Perſon who died of an* Aſthma; *By Mr* W. Cooper, *n.* 336. *p.* 534.

VIII. Mr ------ *St John* died of an Aſthma at 72 Years of Age. It was remarkable, that before the Body was remov'd from the Bed whereon it lay ----- Hours after Death; that the Bliſter in the Neck had diſcharg'd not leſs than a Quart or three Pints of *Serum* before I began the Diſſection.

In the *Abdomen* was a ſmall Quantity of Water, ſuch as is uſual in thoſe who die of Chronical Diſeaſes. The Parts in this lower *Venter* were in a natural State; except

The Kidneys, of which the Right was very much contracted, even to a third Part of it's natural Size, and had two large *Hydatides*, or Bladders of clear Water, on it's Surface.

The Left Kidney was alſo leſſen'd, but not ſo much as the Right: It's Surface, like that, was unequal, but had no *Hydatides* on it.

The *Ureter* of this Left Kidney was very much contorted, at it's Riſe from the *Pelvis*, where it's Sides were petrified; inſomuch that it's Canal was almoſt render'd impervious for the Paſſage of the Urine.

Nothing was found in the Bladder of Urine, but divers Stones of unuſual Figures, as if they had been Pieces of a large Stone broken to Bits, in whoſe Center a Nucleus had been lodg'd.

The Gall-bladder was fill'd with Gall-ſtones.

Nor was the Stomach, which he complain'd of, (*i. e.* in Want of Appetite) any other ways diſorder'd; but a little redder, having more Blood in it's Veſſels than is uſual; it's Muſcular Fibres being ſtronger than we generally find them in the Stomachs of healthful Perſons.

The Cavity of the *Thorax*, or Cheſt, was filled with Water on both Sides, inſomuch that the Lungs were not above a third Part of their natural Magnitude.

The *Pleura*, or Membrane that lines the two Cavities of the *Thorax*, was very much thicken'd by the *Serum* or Water; from whence it deſcended by the Muſcles of the Back into his Legs.

The Valves of the Left Ventricle of the Heart were petrified in ſeveral Places, eſpecially thoſe call'd *Mitrales*.

There were ſome ſtoney Bodies found on the *Bronchiæ*, at and near their Riſe from the Lungs.

An Account of an Apoſtemation *of the* Lungs *cured*; *by Dr* J Wright. *n.* 285 *p.* 1372.

IX. 1. Mrs *Jane Terry* fell ill of the Small-Pox in *May* 1701. She was about 18 Years old, of a freſh Complexion, and pretty fleſhy. Her Relations apprehending ſhe might have the Small-Pox, remov'd her to a Nurſe's Houſe, where ſhe had the diſtinct Sort very kindly; her Caſe proceeded ſo very well, (as they conceiv'd) that no Phyſician was called to her, 'till they began to ſhell, only for ſome days before ſhe had a little Difficulty in her Breathing, which gradually increaſed, 'till ſhe began to raiſe Blood, which was about the 7th Day from their firſt appearing. This raiſing of Blood was accompanied with theſe Circumſtances; it had increaſed every Day for three Days before I ſaw her; ſhe cough'd and brought up a viſcous Phelgm, ſuch as People vomit when their Stomachs are very foul; only as meer Phlegm is white, this was all of it as red as Blood; it was not ſtreak'd with Blood, nor had it a Mixture of white Phlegm with it, but was ſo deeply colour'd, that it ſeemed to be all Blood, only it would not flow as Blood does whilſt it is hot, nor did coagulate as Blood does when it is cold, but hung from the Baſons, when it was pour'd out, as vomited Phlegm does; and in this it differ'd from all the bloody Expectorations I have ſeen, excepting in one Mr *Jones*, who cough'd the ſame bloody colour'd *Pituita*, but in much leſs Quantity; for Mrs *Terry* raiſed above a Pint in 24 Hours, for ſome Days, and tho' a leſs, yet a conſiderable Quantity afterwards; Mrs *Terry*'s afforded a very ſtrong Smell, but Mr *Jones*'s had no Odour. After ſome Weeks ſhe recover'd, regain'd her Fleſh, which was waſted in her Illneſs; the Menſes return'd, and ſhe continu'd very well from *July* 'till near *Chriſtmas*.

In *Jan.* I was carried to ſee her, and ſhe gave this Account of herſelf.

That about three Weeks before *Chriſtmas* ſhe perceiv'd herſelf a little ſhort-breath'd, which increas'd daily, with a Fulneſs and Weight in her Left Side; that ſhe lay well on the Left Side, but when ſhe turn'd to lie on her Right, ſhe felt as if a Weight fell from the Left to the Right Side, which gave her a Shortneſs of Breath, and made her cough: Thus it continu'd increaſing 'till *Chriſtmas*, when ſhe began to raiſe a conſiderable Quantity of ſtrong ſtinking *Pus*; ſhe ſaid ſhe eat her Victuals well enough all this Time, and was not Feveriſh. When I ſaw her, which was towards the Middle of *January* 1701, ſhe raiſed a conſiderable Quantity, and often, of ſtinking offenſive *Pus*, which was as fluid as the *Pus* of other Parts; her Fleſh was a little abated, but ſhe was at no time Feveriſh; ſhe eat and ſlept pretty well, and had the *Catamenia* duly. I preſcrib'd ſuch Medicines as abated that purulent Expectoration ſeveral times, and ſhe often gave me Hopes of her Recovery, ſhe continuing to have the Menſes regularly, and being ſtill free from an Hectick; but upon every little Cold, ſhe again raiſed that fœtid *Pus* in a conſiderable Quantity. She generally continued pretty free from coughing ſeveral Hours together, 'till ſhe perceiv'd ſomething of a Fullneſs in her Breaſt, which would oblige her to cough; and after ſhe had once begun to raiſe, ſhe could not ceaſe, 'till ſhe had brought up two Spoonfuls or more of that fœtid *Pus*. This ſhe did chiefly in the Morning, Afternoon, and at Night; I did apprehend ſhe had an Abſceſs in the left Lobe of her Lungs, and made her lie upon the Bed, with her Head reaching to the ChamberFloor, leaning upon her left Arm. In this Poſture ſhe could at any time, after a little Cough, ſet the *Pus* a running out of her Mouth, 'till the whole which was therein contain'd was diſcharg'd.

This made it apparent that there was an Ulcer in her Lungs, and Dr *Torleſſe* and Dr *Pitt* approv'd of what I had propoſed, of making an Apertion in her Side, where we could apprehend the Lungs grew to it, for that ſeem'd unqueſtionable from the Poſture of diſcharging it; and ſome little Pain ſhe felt in her Side. About a Week before Mr *Cowper* was ſent for to perform the Operation, the *Pus* had begun again to increaſe, and theDay before theſe Gentlemen ſaw her, ſhe was taken in the Afternoon with a Chilneſs, after which her Pulſe became a little quicker, and ſhe was a little Feveriſh when Mr *Cowper* applied the Cauſtick; this Feveriſh State increaſed every Day, and after ſome Days a Raſh appear'd, which laſted about 14 Days before it was quite got off, and left her in a Hectick, with Redneſs in her Cheeks; towards Evening, Nights Sweats, continual Looſeneſs, extreme waſting of her Fleſh, and at Length a Swelling in her Legs, tho' ſhe kept her Bed. We felt ſome little Knots between the *ſeventh* and *eighth* Rib; which, with other Circumſtances, made us conclude the Adheſion was in that Part, and would have laid the Cauſtick there, but that it would certainly have ſpread to the Glands of her Left Breaſt, which made us lay it between the *ſixth* and *ſeventh* Rib (*ſurſum numerando*): Mr *Cowper*, as ſoon as he could, took it off, and with his Knife gently paſs'd thro' into the Cavity of her Breaſt, whence iſſued a bloodyiſh Water, but no *Pus*; by bending his Probe, he found the Adheſion reach to the lower Edge of the *ſeventh* Rib; and before the Eſcar was ſeparated, the *Pus* began to flow at every Dreſſing, and ſo continu'd, gradually abating, 'till the Ulcer was cured; during which, a Part of the Inſide of that Rib, above an Inch long, exfoliated, and after that another leſſer Piece of the Outſide of the Rib. Towards the latter End of the Cure, ſhe complain'd very much of a Pain at the *Cartilago Enſiformis*, ſo great, that ſhe ſometimes pluck'd out the hollow Tent, which we conceiv'd was occaſion'd by preſſing upon the Nerve. During the firſt ſeven or eight Days of her Raſh, ſhe raiſed very little, if any, of that *Pus*, nor did it diſcharge itſelf then by the Orifice, nor was there a Collection of it in her Breaſt, which made me apprehend, that the Fever did ſo alter the State of her Blood, as not to permit it to ſeparate it's Impurities into the Abſceſs. I muſt obſerve, that for ſix Days before the Fever began, ſhe had the *Catamenia* very orderly; by *Auguſt* ſhe was cur'd, her Side heal'd up, and ſhe would not endure it to be converted into an Iſſue; by *October* ſhe recover'd her Fleſh, and the *Catamenia* return'd, which had been wanting ever ſince *May*, and now ſhe is plump, fleſhy, clear, and freſh complexion'd, has little or no Cough, and no fœtid or tabid Expectorations, and ſeems, and I believe is, perfectly cured, having for many Months taken no Medicine.

On this Caſe I obſerve, that there was an Ulcer in the Lungs, and that it has admitted of a Cure, contrary to the general Opinion of Phyſicians. That this Ulcer did contain at leaſt two Spoonfuls, and muſt have been as large as a Hen's Egg. That this Abſceſs aroſe from a Collection, with an indiſcernable (if any) Fever, and ſo continu'd from *Chriſtmas* to about the 10th of *May*. The tender membranous or veſiculary Compoſition of the Lungs ſeem to juſtify this Opinion, that it is almoſt impoſſible for them to heal, when there is a conſiderable Diminution of them, the continual and indiſpenſable Neceſſity of their Motion, very much hindring the Coalition of the *Veſiculæ*.

Several Parts of the Body afford a proper Cement to unite and repair them, when hurt or diminiſh'd. Carious and broken Bones ſend forth a *Callus*; when the Skin is conſum'd by Ulcers or Burns, the Parts afford a *Cicatrix*, which pretty well ſupplies the Defect of the Skin. The Lungs ſeparate a viſcid *Pituita*, which will be expanded into Fleaks like a Membrane; Mr *Stringer*, *Sarah Deeping*, and ſome other Patients have brought up great Quantities of them, and a little Boy at Mr *Tolley*'s at *Kenſington*, cough'd up ſeveral Pipes, form'd exactly like the *Bronchiæ*, and it's Divarications, and at firſt View ſeem'd to be the internal Membrane. Mr *Buſſiere* mentions this Inſtance, but his Haſte would not permit him to obſerve the Caſe ſo exactly as it deſerv'd: This Child two Years before had an Ulcer in the right Side of his Lungs, and they adher'd to his Back; when I ſepa-

Vid. Supra, V. iii. C. iii. S. vii.

rated them, I found a Cicatrix near three Inches long, but very little (if any) Defect in his Lungs; I am of Opinion this *Pituita*, or *Mucus*, doth ſerve to re-unite the Parts of the Lungs, when there is a Solution by an Ulcer.

Conſumptive People generally flatter themſelves, that they have no Ulcer in the Lungs, becauſe they do not feel a Soreneſs, as in the Ulcers of other Parts. This Opinion keeps them from making a timely Application, whilſt they might receive a ſpeedy and eaſy Cure. When Mr *Cowper* touch'd the ſound or ulcerated Parts of her Lungs with his Probe or Finger, ſhe diſcover'd no Senſe of Feeling, which may confirm the Opinion of Anatomiſts, that the Lungs have little, if any, Senſation. When he touch'd her Heart with his Finger, though I believe for not the twentieth Part of a Minute, ſhe grew very much diſorder'd, pale, and ready to faint; which ſhews Nature cannot ſuffer the leaſt Alteration in it's Pulſation, without great Prejudice and Inconveniency.

It is the Opinion of ſome Phyſicians, that the Fever which attends conſumptive Patients, ariſes from ſome Particles of the *Pus*, which being receiv'd into the Blood, and circulating with it, cauſe that Effervеſcence which we call an Hectick. This Patient had no Fever from *Chriſtmas* to *May*, and then came a continued Fever, with a Raſh, which left Febricitation every Afternoon, with thoſe Symptoms which attend a Hectick.

I have obſerv'd for many Years, that if I could preſerve my conſumptive Patients from that Hectick Fever, or relieve them who already labour'd under it, I could cure them, tho' their Expectoration was very plentiful and foul.

I do not doubt but ſome Part of her Lungs do adhere to her Side, and 'tis probable a little Part of them do not receive the Air in Inſpiration, but I believe that Defect is very inconſiderable, becauſe ſhe can run up Stairs, and is no more diſorder'd in her Breaſt than moſt other People.

The eaſy Diſcharge of the *Pus*, by her lying down in that Poſture, did undoubtedly very much preſerve her Lungs, and prevented it's breaking thro' the Abſceſs, into the Cavity of her Breaſt, and putrifying her Lungs to a greater Degree. *Pus generat Pus*, is a noted Aphoriſm, and the Air-Bladders of the Lungs are ſo very tender, that they muſt have yielded to the Preſſure of the *Pus*, had it lain long in the Abſceſs, and been only diſcharg'd by violent coughing. By lying in a proper Poſture, Sir *Thomas Proby*, *Sarah Deeping*, and other Perſons, have prevented a greater Solution in their Lungs, and either prolong'd their Lives many Years, or recover'd their Healths by proper Medicines.

This and other Inſtances, make me eaſily concur with ſome Phyſicians in an Opinion, that in ſome Families the Lungs have originally a more tender Conſtitution than in others. Mrs *Terry*'s Aunts are ſubject to great Coughs and Phthiſick. Her Aunt *Fowke*'s little Daughter, of about 7 Years old, having a little Fever, with ſome Symptoms of the Small-Pox, but a great Difficulty in Breathing, I adviſ'd her bleeding at the Arm, but ſhe was ſo fat, that a Vein could not be found

that

Plate IX.

124.

Fig. 127.

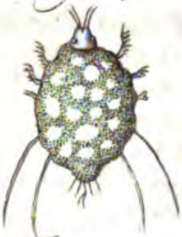


Fig. 128.

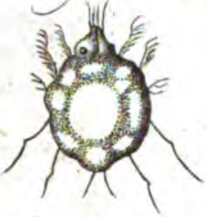
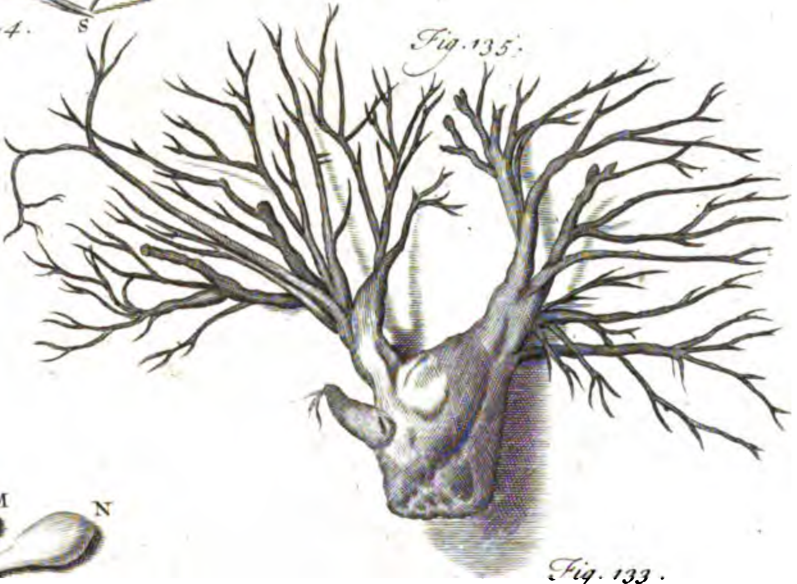


Fig. 129

Fig. 130

Fig. 135.



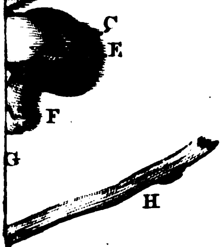


Fig. 133.

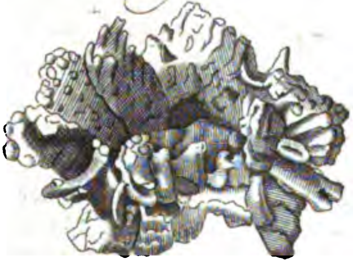


Fig. 131.

Fig. 134.

M. V.dr Gucht Sculp

that Night; next Day the Small-Pox appear'd, which a little eas'd her Lungs; upon the ſixth Night after, ſhe rais'd at ſeveral times about 7 or 8 Ounces of clear Blood, by violent coughing: I was ſent for, and drew away about 6 Ounces of Blood by Leeches, which totally reliev'd her Breath, and ſtopt the raiſing Blood. This Inſtance I mention, being ſo like Mrs *Terry*'s; and to evince, that ſo great Loſs of Blood will not hinder the regular Proceeding of the Small-Pox, which ſhe went through very orderly, and recover'd perfectly. I have obſerv'd the ſame Effect in other Patients, in whom Bleeding, after Eruption, was indiſpenſible.

The continual Motion of the Breaſt in Breathing, made the Cauſtic ſpread farther than it was deſign'd, or could be prevented: I have prevail'd with ſome Patients to yield to an Apertion by Launcet, which I take (in ſome Caſes) to be the better way. That little Blood which may poſſibly get into the Cavity of the Breaſt, is eaſily thrown out again by the Lungs in Inſpiration, as Mrs *Terry* did the Injection every time it was uſed.

After the *Pus* began to flow at the Orifice, it leſſen'd the raiſing it at her Mouth, and, in no long time, the purulent Expectoration totally ceas'd.

I omit ſome other Remarks of leſs Conſequence, *viz.* on the Bloody-colour'd *Pituita*, the Foetid Odour of the *Pus*, and the Raſh Fever, which came without any manifeſt Cauſe.

On the ſame, by Mr W. Cowper, *ibid. p.* 1386.

2.] The Matter or *Pus* which firſt flow'd from Mrs *Terry*'s Side, was ſo offenſive in it's Scent, as obliged the By-ſtanders to quit the Chamber, inſomuch that the Nurſe, uſually at the Time of Dreſſing, and afterwards, was wont to burn Roſemary, &c. to ſuppreſs the Stench. So putrid was the *Pus*, that it tarniſh'd that End of the Silver Probe I paſs'd into the Cavity of the Abſceſs, as it did the Top of a Silver Syringe in making Injections. There ſeems no room to doubt, that the *Pus*, which then flow'd from her Side, came from the ſame Cavity the *Pus* did ſhe before cough'd up, when the Liquor that was injected at her Side came into her Mouth; which ſhe frequently complain'd of, and particularly of the bitteriſh Taſte of the Tincture of Myrrh I ſometimes uſed in the Injections.

The Diſeaſes of the Lungs have been look'd on as very dangerous: And if Obſervations did not aſſure us of the Poſſibility of Succeſs, the commonly-known Structure of the Lungs would afford us but mean Arguments for the Shift Nature makes. I ſhall give a ſhort Account of ſome other Inſtances of the like Nature I have met with.

About two or three Years ſince, I ſaw a Boy, in the ninth or tenth Year of his Age, who (ſome time before) after a Continu'd Fever, was purſu'd with an Intermitting one; a Cough follow'd, in which he brought up (at ſhort Intervals) no ſmall Quantity of thick purulent ſtinking *Pus*, which Diſcharge (I think) continu'd on him no leſs than fourteen or fifteen Months before I ſaw him: His Phyſicians order'd him Iſſues in his Back. He had then a healthy Aſpect, his Cheeks florid, and was very briſk and active: When he juſt came from Play, he was bid to take a Baſon in his Hand and cough as he was wont; which he did, wherein I ſaw him diſcharge at his Mouth, no leſs than 4 or 5 Ounces of the Sort of *Pus* above mentioned: This his Mother told me he had been wont to do twice every Day; nor did he appear any ways diſordered after, but return'd to play immediately. His Phyſicians ſent him into the Country whence he came, where, in about a Twelve Month, I heard he died, but was not acquainted with his Circumſtances after: What Succeſs the Operation we practiſed on Mrs *Terry* would have had on this Boy, I dare not determine; tho' I cannot but think it might have been ſafely done to him.

Another Inſtance in which a conſiderable Part of the Lungs was obſtructed, and conſequently became uſeleſs, (ſome time before Death) was in a Girl of ſixteen, who had been ſcrophulous not leſs than 9 Years; the Glands about her Neck and Throat being very much indurated as well as diſtended, her Lips and Noſe were alſo ſwoln: About a Year and a half before her Death, ſhe coughed up ſeven or eight Ounces of fœtid *Pus* in leſs than 24 Hours. On changing the Air of this Town for that in the Country, together with the uſe of Balſamick Pectorals, ſhe recover'd a healthful Appearance in her Face, but continued ſomething Aſthmatick. On taking Cold (as 'tis called) her Appetite as well as Digeſtion fail'd her, ſhe grew feveriſh, and died after a few Days Indiſpoſition.

On opening the *Thorax*, I found the Lungs cleaving to the *Pleura* of the Left-ſide, in ſuch Manner that they could not be ſeparated, without one of thoſe Parts borrowing from the other. A Portion of one of the Left *Lobes* of the Lungs being cut off, ſunk in Water; from which Part 'twas likely the Matter came which ſhe formerly coughed up, tho' the Ulcer was then cloſed, and no Appearance of Matter was to be ſeen in that or any other Part of the Lungs. The Lymphatick Glands at the Divarication of the Wine-pipe had, by their Intumeſcence, ſo compreſs'd the Canal on the Left-ſide, that it wanted more than two Thirds of it's proper Paſſage for the Air.

In theſe, and ſome other Inſtances I could produce, 'tis evident that conſiderable Parts of the Lungs may be obſtructed, and the Perſon ſurvive: But Mrs *Terry*'s Caſe demonſtrates the Poſſibility of their Recovery, when Part of their Lungs are totally obſtructed, as muſt happen in ſuch large Abſceſſes. But how the remaining ſound Parts of ſuch diſeaſed Lungs become capable of tranſmitting the whole Maſs of Blood from the Right Ventricle of the Heart to the Left, in equal Time and Quantity with the Blood that circulates in the reſt of the Parts, ſeems not eaſily accounted for, when indeed it exacts our Wonder, that it is done in a natural State, when all the Paſſages of the Lungs are open and free. Since I had often found Water, injected by the *Arteria Pulmonalis*, return readily from the Lungs again by the *Vena Pulmonalis*, I was tempted to try if melted Wax, when very hot, would not do the like, which ſucceeded in two young Cats Lungs; for after injecting the Wax (mixed with Oil of Turpentine, and tinged with Vermillion) by the *Arteria Pulmonalis*, I found it had filled the Pulmonic Vein with the left Auricle, inſomuch that ſome of the Wax had reach'd the left Ventricle of the Heart: I don't remember this Experiment ſucceeded, but that ſome of the Wax was extravaſated, and came into the *Bronchiæ* and Wind-pipe at the ſame time.

In preparing a human Heart, by filling it's Ventricles, Auricles, and Trunks of it's large Blood-Veſſels with Wax, I found on injecting the Pulmonick Arteries and Veins with Wax differently tinged, that the Wax paſs'd from the Veins to the Arteries without coming into the *Bronchiæ*, or being extravas'd, tho' the Wax was not injected with near ſo much Force as might be. I muſt confeſs I was never ſo fortunate to make Wax paſs from the Arteries to the Veins in human Bodies or Quadrupeds, unleſs in their Lungs, as above noted, and the *Spleen* and *Penis*: Nor do I remember it has happened in thoſe Parts, but when the Wax has been impell'd with great Force, tho' I have conſtantly obſerved the Communication of Arteries and Veins of the *Spleen* and *Penis* more open than in other Parts, except the Lungs. I wiſh Dr * *Morland* had told us in what Part of the Human Body Dr *Areſkin* had made Wax paſs from the Arteries to the Veins, ſo as to demonſtrate their Continuation to the naked Eye, becauſe I have hitherto found the naked Eye unable to diſcover the Extremities of the Arteries and Veins, when the Blood itſelf was moving in them, in the tranſparent Parts of the *Omentum* or *Meſentery* of Quadrupeds, or in the Lungs of Frogs or Lizards, when living; or after Death, when the Blood has been retained in their Lungs in the following Manner: On making Inciſion into the Bodies of theſe Creatures, their Lungs will ſtart out, and be diſtended with inſpired Air; on which, make what Haſte you can to paſs a Ligature (*i. e.* a wax'd Thread) and tie it firmly toward the upper Part of the Lobe, as near the Heart as you can: when the Lungs of Frogs and Lizards are dried, and thus diſtended, you may examine them with a Microſcope.

* *Vid.* Infra, Ch. V. §. 1.

It appears that the Communications between the Arteries and Veins of the Lungs are more open than thoſe of other Parts, at leaſt in the Feet of Frogs: And till it can be ſhewn that melted Wax can be as eaſily injected from the Arteries to the Veins of other Parts in an Human Body and Quadrupeds, I ſhall be inclin'd to think the Communications between the Pulmonic Arteries and Veins in general, are more open than the Arteries and Veins of other Parts, except the *Spleen* and *Penis*.

This patent Communication of the Arteries with the Veins of the Lungs, ſhews how thoſe Veſſels tranſmit the Blood in equal Time and Quantity with the Blood that moves in the reſt of the Blood-Veſſels of the whole Body in a healthful State.

Hence it is, when any of the Blood-Veſſels of the Lungs are ſtraitened or totally compreſs'd (either or both which Circumſtances muſt happen in Mrs *Terry*'s Caſe) the remaining unobſtructed Blood-Veſſels are forced to diſcharge more than they were wont; and in Time thoſe Veſſels become ſufficiently dilated to ſupply the Defect: The like happens in the communicant Branches of the Arteries of any Part, when ſome conſiderable Branch or Trunk is ty'd up, as in the Operation for curing of an * Aneuriſm.

* Vid. Infra, *cap.* VI. §. III.

Fig. 138. *Fig.* 138, repreſents that part of the 142d Figure at D..... done by a larger Magnifying-Glaſs, *i. e.* by the 3d Glaſs of Mr *Wilſon*'s Microſcope.

A, The Arteries. B, The Veins of a Frog's Lungs prepared as above mentioned. C, Their Inoſculations with each other. D,..... The *Area* of the Microſcope, as it appears to the naked Eye.

Fig. 139. Part of the hinder *Foot* of the young *Frog* view'd with the ſame Microſcope when living; whereby the different Magnitude of the Extremities of the *Arteries* and *Veins* of the *Lungs* in *Fig.* 138, and in this expreſs'd at C C, is very evident; the former being capable of admitting at leaſt three Globules of Blood to paſs in a Breaſt, whereas the Extremities of the *Arteries* and *Veins* in the *Feet* admit of one Globule of the Blood only to paſs before the other.

A, A, The Trunks of the *Arteries*. B, B, Thoſe of the *Veins* lying by the Side of the *Toes*. C, C. Their *Extremities* continu'd with each other, in the tranſparent *Membrane* between the *Frog*'s *Toes*. *a*, *a*, Two of the *Frog*'s *Toes*.

Fig. 140, 141. The Extremities of the *Arteries* and *Veins* of a *Frog*'s *Lungs* view'd with the 4th Glaſs of the ſame Microſcope.

A, A, The *Arteries*. B, B, The *Veins*. C, C, Their *Conjunctions* with each other. D, The *Area* of the Microſcope.

Fig. 142. One of the *Hexagon Areæ* of a *Frog*'s *Lungs*, which were not ſo much diſtended by Inflation, as thoſe Parts of the *Lungs* repreſented in the two former *Figures*; whereby the little *Areæ* or Cells in the Interſtices of the Extremities of the *Veins* and *Arteries* appear cloſer and leſs than in the two foregoing *Figures*, tho' view'd by the ſame Microſcope.

A, The *Arteries*. B, The *Veins*. D, The *Area*, which is more magnify'd at *Fig.* 138.

Fig. 143. *Fig.* 143. The lower-part of one of the *Lobes* of a *Water Lizard*'s *Lungs*, as it appears by the Microſcope, when the Blood is retain'd in the Extremities of the Veſſels, as in the preceding *Figures*. A, A, The Trunk of the *Pulmonic Artery*. B, B, The *Vein*. C, C,.. Their *Branches* joyning with each other. D, D, The tranſparent ſmooth *Membrane*, which in this Creature is not veſiculated or full of Cells, as in the *Lungs* of *Frogs*, on which the *Blood-Veſſels* are expanded, nor does the Internal Surface of this Membrane differ from the External, as in *Frogs* and divers amphibious Creatures; the *Lungs* of the *Water Lizard*'s being veſicated, and not veſiculated.

N. B. The Microſcope uſed in drawing theſe *Figures*, is Mr *Wilſon*'s deſcrib'd before. [*Vid.* ſupra *Vol.* IV. *cap.* II. § VII.] The manner

ner of applying the dried Lungs here mentioned is thus. Take out the Glaſſes in the Slider or flat Piece of Ivory, [*Fig.* 73.] *e*, *e*, *f*, *f*, and paſte in the Holes, *f*, *f*, parts of the dry'd Lungs as mentioned, whether of Frogs, Toads, Snakes, Vipers, or the like Creatures, that have their Lungs veſicated as well as veſiculated; and by this means you may keep Objects of the Lungs of thoſe Animals always by you; ſome of which I have had theſe three Months, and are as beautiful as when firſt put in; only remember to place the external ſmooth Surface of the Lungs towards your Object Glaſs when you view it. In the ſame manner, the Extremities of the Blood Veſſels of any tranſparent Parts of Animal Bodies may be examined by that Microſcope.

X. I lately ſaw opened a young Man in St *Bartholomew*'s *Hoſpital*, that died of the *Palpitation of the Heart*, whoſe violent Beating and prodigious ſubſultory Motion, for ſome Months before his Death, was not only eaſily felt by laying the Hand on the Region of the Heart: but ſeen to riſe and fall by raiſing the Bedcloaths, that covered it. And, which is almoſt incredible, ſometimes the Trembling and Throbbing made ſuch a Noiſe in his Breaſt, as plainly could be heard at ſome Diſtance from his Bed-ſide. This was accompanied with frequent *Deliquiums*, ſometimes ſlow, ſometimes ſwift, and often intermitting.

The left Ventricle *of the* Heart *prodigiouſly* diſtended: *by Dr* J. Douglas. *n.* 345. *p.* 326.

Fernelius in *Pathol.* lib. 5. cap. 12. gives us an Obſervation of this kind; where he ſays the frequent Concuſſion of the Heart was ſo violent and powerful, as not only to diſplace or luxate, but even to break ſome of the adjoining Ribs; and *Sylvius de la Boë* has a parallel Obſervation in his Account of this Diſeaſe.

Kerkringius relates the Hiſtory of a Woman he opened, whoſe Heart was of a prodigious Bigneſs, in his *Spicileg. Anat.* Obſ. 16. As does *Monſieur Dionis*, at the End of his Anatomy, where the right Auricle of the Heart was dilated to the Bigneſs of the Head of a new-born Child.

In the Diſſection of the morbid Heart, I obſerved the following remarkable Particulars.

1. That the *Pericardium* or *Capſula Cordis* was very thick, and firmly adhered or grew by a fibrous Connection to all the outer Surface of the Heart.

2. Inſtead of the Water called *Liquor Pericardii*, there was only in ſome Places about the *Baſis* of the Heart, a mucilaginous clear Subſtance like a Jelly.

3. In the right Auricle laid open, there was nothing præternatural. The aſcending and deſcending *Cava* opened in the ſame as uſual. The *Veſtigium* or Mark of the *Foramen ovale*, with it's ſemicircular *Limbus*, was very plain.

And the *Orificium* of the *Vena Cordis Coronaria* was extremely large; yet it's Valve was leſs than uſual.

4. In the right Ventricle laid open, the *Valvulæ* called *Tricuſpides* were configurate after the uſual Manner. The Sides of this Cavity were thin and full of ſmall fleſhy *Columnæ*, as they commonly are, with great Variety of Furrows and little Holes. The three *Sigmoide* or *ſemilunar Valves*, in the Mouth of the *Arteria pulmonalis*, were as they always are in a natural State.

5. The left Auricle, was not much bigger than ordinary; but it's muſcular Appendage, called the *Bulb* of the *Pulmonary Vein* by the late Mr *Cowper*, was extraordinarily dilated and enlarged, beyond any Thing that I ever ſaw.

6. The left Ventricle, whoſe Capacity in a natural State is always leſs than the Right, was here conſiderably larger. And if the Experiment had been made, before Diſſection, of filling both with any Liquor, this had certainly contained three times more than the other.

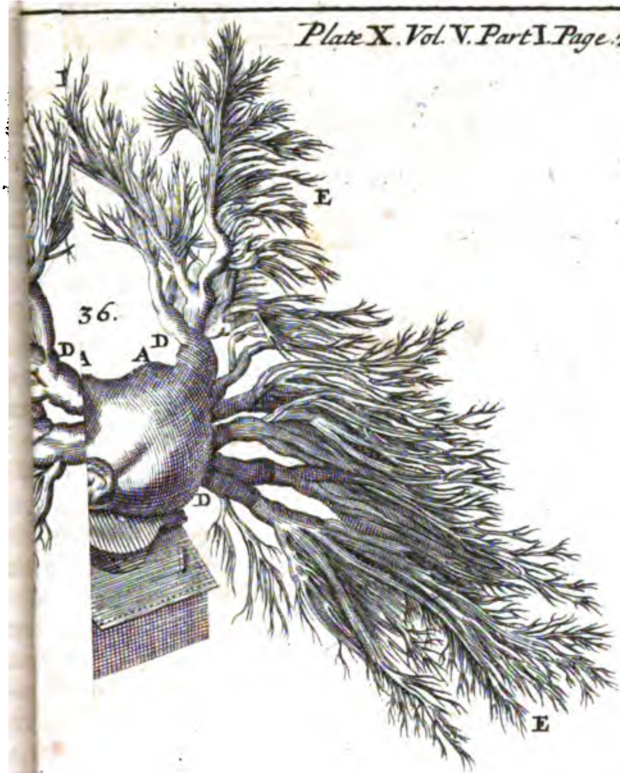
7. The *Valvulæ* called *Mitrales*, placed at the Orifice of this Ventricle, are much thicker in Subſtance than ordinary; and the two fleſhy Columns, called by *Nicholaus Maſſa*, almoſt 200 Years ago, *duo parvi muſculi*, which ſend out abundance of ſmall Tendons to be inſerted into theſe Valves, were proportionably augmented in Bigneſs.

8. The *ſemilunary Valves* in the Mouth of the *Aorta*, or of that great *Vena pulſatilis* that diſpenſes the Blood to all the ſeveral Parts of the human Body, were very much præternaturally affected; as would eaſily appear upon comparing them with thoſe in the Orifice of the *pulmonary Artery*, in which they are thin and very broad, ſo as to be able to ſhut the Cavity of that Veſſel, and hinder the Blood from returning back into the Ventricle, and likewiſe tranſparent; but in this they are very thick, contracted, as it were, and furled together, and of a whitiſh Colour; and, in all Appearance, if the Perſon had lived longer, they had turned Boney, or undergone a Petrification.

As to the chief Symptom, the *Palpitation* of the *Heart*, it is not improbable but the firm Adheſion of the *Capſula Cordis membranoſa* to the Subſtance of the Heart, occaſioned that uncommon Trembling and Throbbing thereof: It's free and eaſy Motion being hindered by that thick *Involucrum* which ſurrounded it ſo cloſe on each Side. The learned Dr *Lower*, in his Treatiſe *de Corde humano*, gives us ſuch an Inſtance, and explains the Palpitation after this manner.

As to the Dilatation of the left Ventricle, and muſcular Bag of the *Pulmonary Vein*, it was altogether owing to the ill Configuration of the *Valves* we have now deſcribed; for as the great Artery or *Aorta* ariſes out of this Ventricle, it has three Valves, which, ſeparating, give Paſſage to the Blood from the Ventricle into the Veſſels; and in a natural State they ſhut that Paſſage, and ſo prevent the Blood from recoiling into the ſame, if it ſhould endeavour to return. But in this Caſe, by reaſon of it's contracted Narrowneſs and Thickneſs, not being able to cloſe or ſhut the Paſſage, the Blood flow'd back again into the Cavity,

Plate X. Vol. V. Part I. Page. 232



36.

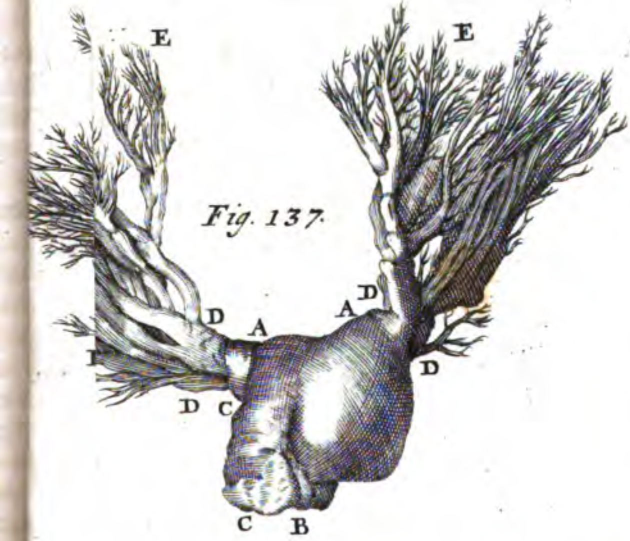


Fig. 137.

I. Harris sculp.

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which it had gradually enlarg'd, and dilated to this Bigneſs. Beſides, the *Muſcular Valves* not being duly qualified for the Performance of their Office, the Blood recoiled into the *Auricle*, which it had diſtended in the like Manner. This conſtant Regurgitation or Reflux of the Blood is beſides ſufficient of itſelf to produce this extraordinary Trembling, or ϖαλμὸς καρδίας, as the *Greeks* call it.

Two Caſes of a Dropſy, *by Mr* W. Cheſeldon. *n.* 337. *p* 281. Fig. 144.

XI. 1. *Fig.* 144. Shews the Beginning of the *Aorta*, from the Heart of a Woman who died of a *Dropſy*. A, is the *Aorta*. B, B, two Chalk-Stones which poſſeſs'd the Place of the *Semilunar Valves*: The left Ventricle of the Heart was dilated to twice it's natural Magnitude. I ſuppoſe that theſe Stones occaſioned the *Dropſy*, by obſtructing the *Valves*, and hindering a regular Diſtribution of the Blood.

Fig. 145.

2.] *Fig.* 145. Shews a Bone taken from between the Ventricles of the Heart of a Man who died *Hydropic* and *Tabid*: In this Body the whole *Pericardium* adhered to the Heart.

The Vena Azygos *inſerted into the* Right Auricle, &c. *by the ſame.* n. 337. *p* 282.

XII. I have ſeen a *Heart* with the *Vena Azygos* inſerted into the *Right Auricle*; and the deſcending *Cava* coming round the Baſis of the Heart, above the *Aorta* and Pulmonary Veſſels, to enter the *Auricle* at the lower Part with the *Aſcending Cava*.

Of the Force *of the* Heart, *by Dr* J. Jurin. *n.* 358. *p* 864.

XIII. 1. As many things have been deliver'd concerning the *Force* of the *Heart*, which are but little convincing, and which are contrary to one another, as well as to Reaſon; give me leave to propoſe a new Solution of this famous Problem. I ſhall therefore ſhew firſt what Objection there is to the Demonſtration of *Borellus*, then I ſhall take the Solutions of the learned *Morland* and *Keil* into examination, with the like philoſophical Liberty.

1. The firſt fault we have to find with *Borelli*'s Solution, and which indeed is far the greateſt, is, that he expounds the Power of the Heart by a ſluggiſh Weight at Reſt. For whereas the Heart itſelf is in motion while it contracts, and communicates motion to the Bodies oppoſing it, that is the Blood and the Tunicks of the Arteries, it is plain it cannot be known how great it's Power is any other way, than by making known the quantity of this Motion. But any Motion can no more be compared with a Weight at Reſt, than a Line can be compared with a Rectangle.

2. Secondly, that in the Experiment itſelf made by the Circulator, it does not at all appear that the Weight was ſuſpended by the contracting Force of the Muſcles alone. For aſſiſtance may be ſupply'd by that Force, by which the Muſcles made uſe of, as alſo the Cheeks, and perhaps the Ligaments themſelves oppoſe their Divulſion and the burſting of the Fibres, and by which alſo the Muſcles taken from a Carcaſe ſuſtain pretty heavy Weight.

3. That *Borellus* makes thoſe Forces equal, which belong to Muſ-

cles that are equal in Weight; which ſeems to be very doubtful, eſpecially when the Muſcles are unlike.

4. That he ſuppoſes the whole Power of the Heart to be apply'd at each Syſtole, and to be the greateſt that can be exerted, with the utmoſt contention and endeavour of the Fibres. Whereas the Circulator itſelf muſt yield to the labour in no long time, if it ſhould endeavour to lift the ſuſpended Weight either continually, or by turns after making a very ſhort pauſe.

5. That he makes the Reſiſtance of the Blood and Arteries to be ſixty times the whole Power of the Heart, inſtead of that Power which is exerted by the Heart to perform a Syſtole, and which perhaps is the leaſt part of the whole Power.

6. That he commits a great Error in determining that Proportion of ſixty times. For in *Prop.* 60. inſtead of the Ratio, which the Sum of the Powers *P* and *Q* has to the Sum of *R* and *S*, he uſes the Ratio which is between the Rectangle of the Powers *P* and *Q* and the Rectangle of *R* and *S*, which miſtake if it be corrected through the ſubſequent Propoſitions, we ſhall have in *Prop.* 73. a far greater Reſiſtance than that which is determin'd by *Borelli*, that is the Weight of 1,076,000 Pounds, inſtead of 180,000, and this by the Poſitions laid down by this great Man.

7. Laſtly, becauſe he obtrudes it upon his Readers as a kind of Miracle, that this weight of 180,000 Pounds is exceeded by the Power of the Heart equal to 3,000 Pounds, and calls in the Force of Percuſſion to aſſiſt him at a dead lift. Whereas there is no more Wonder in this, than when a weight of 3,000 Pounds makes an Equilibrium with another weight of 180,000 Pounds, which is hung at one ſixtieth part of the Diſtance from the Center of a Ballance of unequal Arms.

As to ſome leſſer Miſtakes, and ſeveral Hypotheſes which are not only arbitrary but contrary to one another, we ſhall gladly paſs them over in Silence.

The very learned *Joſeph Morland* comes next, who in his Diſquiſitions about the Force of the Heart publiſh'd in Engliſh, has given a very ingenious Method of reducing the Power of the Heart to Experiment. Now beſides the Error before obſerved in *Borelli*, or comparing the Force of the Heart with a Weight at Reſt, he is to be taken Notice of on this account alſo, that he ſuppoſes the whole Action of the Heart to be laid out in ſtretching the Tunicks of the Arteries. For the Heart does not only diſtend the Arteries, but alſo drives the Blood forward with a certain Velocity through the whole Tract of the Arteries and Veins.

Now it remains to conſider the Solution of the ingenious Dr. *James Keil*, which he propoſes in his Medico-Phyſical Eſſays, belonging to his Treatiſe of the Animal Oeconomy. He was the firſt Man that ventured, not only to reject the Power of the Heart determin'd by *Borelli*, but alſo to ſubſtitute another, which is almoſt infinitely leſs than that.

Now we judge him to have been miſtaken in what follows; beſides that he has fallen into that firſt Error of *Borelli*'s Solution.

For ſurely he has but ill underſtood that Corollary of *Newton*, for defining the Force of the Heart, or has wrongly apply'd it. For that weight which is determin'd by our *Britiſh Archimedes*, by which the Motion of the Water running out of the Veſſel may be produced, by no means does produce the Motion of the Water; for it acquires it's own Motion in falling by the Force of Gravity. But this weight, by falling for a given time, conceives a Motion equal to the Motion of the Water running out in the ſame given Time.

Beſides this learned Man ſuppoſes, that the Velocity of the Blood flowing out of the Heart is always equal through the whole duration of the Syſtole, which we ſhall ſhew in what follows to be notably unequal.

Alſo in that more ſimple Method, which this very learned Man afterwards makes uſe of, beſides the faults already obſerved, he commits two others.

He aſſumes that in different Animals, the Powers of the Heart will have the ſame Ratio to one another as the Weights of the ſame; which afterwards we ſhall ſhew to be falſe. Then he ſuppoſes the Velocity of the Blood flowing out of the Iliac Artery when cut, to be the ſame with which it is emitted out of the Heart into the Aorta. But ſince almoſt all the Blood expell'd out of the Heart is emitted through the other Iliac when cut, it is plain it's Velocity muſt be ſo much greater in the Iliac than in the Aorta, as the circular Section of the Iliac is exceeded by the Section of the Aorta. Beſides the equable Velocity with which the Blood flows through the Aorta, is very different from that Velocity with which it iſſues from the Heart itſelf.

And much in the ſame manner may that Method be refuted, which this learned Man makes uſe of, to determine the Ratio between the ſeveral Velocities of the Blood flowing through the Aorta, when it ſometimes is reſiſted and ſometimes not. But ſince by that Experiment not only one but both of the Velocities will be found greater than it ſhould be, the Ratio between them will not be greatly affected, but his proportion may be pretty ſafely admitted, as not varying much from the Truth.

Having thus prepared our way to the main point, we may now purſue it with greater accuracy.

By the Terms *Power or Force of the Heart*, we mean either the Motion itſelf of the Heart, while it performs it's Contraction, or the Motion of any weight, which beiug oppoſed to the Blood ruſhing out of the Heart, and carryed the contrary way by a proper Velocity, can by an equal Force ballance and ſtop the Efflux of the Blood, and thereby hinder that Contraction.

Since it is hardly to be hoped that we ſhould determine that Power *à priori*, becauſe we have not a ſufficient knowledge of the internal

Structure of the Heart, or of the Nature and Force of the contracting Cauſe; nothing is left but to eſtimate the ſame by it's Effects, or *à poſteriori.*

The whole Action of the Heart conſiſts in the Contraction of it's Ventricles. But the Ventricles in contracting urge the Blood, and by communicating a part of their Motion to it, drive it out with a great force where it can find a paſſage. Thus the Blood being forced into the Arteries, the Aorta and Pulmonic, and ruſhing with Violence every way, it impinges partly upon the Tunicks of the Arteries that are fallen and lank from the foregoing Syſtole, and partly upon the Blood that went before now flowing but ſlowly. Whence by degrees the Tunicks of the Arteries are thruſt outwards, and the foregoing Blood is accelerated in it's courſe. Now if we conceive in our Minds that the Arteries are diſtinguiſh'd by very ſmall tranſverſe Sections; at the firſt ſmall portion of Blood ruſhing from the Heart into the firſt Section, that Section will be partly diſtended, and partly the Blood before contained in the ſame will be thruſt into the next Section, which it will alſo diſtend, and thus this Action will be continued through the ſucceeding Sections of the Arteries. Then the ſecond and third and following little portions of Blood will fall upon the firſt Section of the Artery, and will dilate it ſomething more, and propel the Blood contained in the ſame into the next Sections ſucceſſively; and thus it proceeds till all the Blood is ejected out of the Ventricles. But this muſt be obſerved, that the more contracted and flaccid the Arteries are, ſo much the leſs reſiſtance they give to their Dilatation; and the more dilated they are, ſo much the more they withſtand a farther Dilatation. And therefore the Force of the Blood guſhing out of the Heart at firſt is more expended upon the Diſtention of the Arteries, than upon the protruſion of the foregoing Blood; but at laſt the antecedent Blood is more propell'd than the Arteries are diſtended, becauſe being already become rigid, 'tis with difficulty they admit any farther Diſtention.

Now as the Blood ruſhing out of the Heart communicates part of it's Motion (as ſaid before) to the Tunicks of the Arteries, and part to the foregoing Blood, it muſt needs abate of it's former Velocity. And therefore as it hinders the Contraction of the Ventricles, it receives a new Impulſe from them, part of which it impends on the Coats of the Arteries and the foregoing Blood, in the manner before deſcribed; whence it is again retarded, and receives another Stroke from the Ventricles, and ſo on till it is all expell'd out of the Ventricles.

Beſides the cauſe already explained there is ſtill another, by which the Blood flowing out of the Heart is retarded by degrees, and ſo receives new ſtrokes ſucceſſively by the Ventricles contracting themſelves. For as the Blood flows into the Aorta, if it is ſuppos'd to meet with no Reſiſtance at all, and ſo to ſuffer no diminution of Motion, yet it muſt continually increaſe in length as it paſſes from a wide into a narrow place, till the whole is come into the Aorta: And as the Section of the

Aorta is not leſſen'd, the Velocity of the Blood muſt neceſſarily be leſſen'd. For the Motion of the Blood is in a Ratio compounded of the Ratio of the Section of the Aorta, of the Velocity in the ſame, and of the length of the Column of Blood, by our third Theorem concerning the Motion of running Waters. And ſince that portion of the Blood, which is already come into the Aorta, will be gradually retarded, the Blood will thence be retarded which is ſtill in the Ventricle, and hence the Contraction of the Ventricle itſelf will be retarded. Whence the Ventricles will continually communicate another and another part of their Motion to the contiguous Blood, which for theſe reaſons is conſtantly retarded. Now hence it appears (to take notice of it by the bye), that the Motion of the Blood iſſuing out of the Heart is one thing, and the Motion of the ſame already expell'd out of the Heart, and flowing within the Arteries, is another thing. Alſo the Stroke or Impulſe of the Ventricles impreſs'd upon the Blood, which otherwiſe would be but one, and would be perform'd in an Inſtant of Time, yet is continued through the whole Syſtole of the Heart, by the Force of the Cauſes mention'd above, by which the Blood is perpetually retarded.

See above Vol. IV. C V. §. iv.

Therefore we may conſider each of the Ventricles of the Heart impelling the Blood, as a given Body impinging with a given Velocity upon another Body at Reſt, to which part of the Motion being communicated, both the Bodies will move forwards with a common Velocity. Now the Power of the ſame will be equal either to the Product of the weight of the Ventricle and its initial Velocity, before it impinges upon the Blood; or to the Sum of the Motions of the Ventricle and the Blood iſſuing out of the ſame, and of the Motion which is communicated to the Coats of the Arteries and the foregoing Blood; or elſe, if we ſuppoſe there is no Reſiſtance from the Arteries and the foregoing Blood, to the Sum of the Motions of the Ventricle itſelf and the iſſuing Blood.

Theorem I. *The Motion by which a Machine is contracted which is hollow and unequally contractible, is equal to the Sum of the Products of the ſeveral Particles of the Machine, drawn into their Reſpective Velocities.*

This is plain from Mechanicks.

Corol. 1. The Motion of a Machine is leſs than the Product of the weight of the Machine, drawn into the Velocity of thoſe parts of the Machine that are moved ſwifteſt of all in the Contraction.

2. The Motion of the Machine is equal to the Product of the weight of the ſame, drawn into ſome mean Velocity between the Velocities of thoſe parts of the Machine which are moved ſwifteſt, and of thoſe which are moved ſloweſt of all.

3. If ſeveral ſimilar Machines are contracted ſimilarly, with a mean Velocity which is either equable or inequable, yet is ſimilarly increaſed or diminiſh'd in all the Machines: The Motion by which each Machine

is contracted, is in a compound Ratio, of the quadruplicate Ratio of the homologous Diameter of that Machine, and the inverſe Ratio of the Time in which the Contraction of the Machine is perform'd; or a Ratio compounded of the Ratio of the weight of the Machine, the ſubtriplicate Ratio of the ſame weight, and the inverſe Ratio of the Time.

n 357 p. 929. Theor. II. *If out of the hollow Machine* A B C D, *which is unequally contractible, Water is ſqueezed forth by the Contraction of the Machine, the Motion of the Water iſſuing at the Orifice* A, *is equal to the Sum of the Factors of any tranſverſe Sections of all the Filaments of the Water* Fig. 146. A B, A C, A D,; *each being drawn into the Lengths, and the reſpective Velocities.*

Demonſtration. Inſtead of the Filaments of the Water, let the whole Machine be conceived to conſiſt of very ſmall Tubes unequally large A B, A C, A D, determining at the Orifice A.

The Motion of the Water in every Tube is equal to any Section of that Tube, drawn into the Velocity of the Water flowing through that Section, and into the Length of the ſame Tube; by *Theor. 3. of the Motion of running Waters.* Therefore the Sum of the Motions of the Water in all the Tubes taken together, or the Motion of the Water guſhing out of the Orifice of the Machine, is equal to the Sum of the Factors of the Sections of all the Tubes or Filaments of Water, drawn into the Lengths, and the Velocities reſpectively. *Q. E. D.*

Corol. 1. The Motion of the iſſuing Water is leſs than the Product of the Orifice A, the Velocity of the iſſuing Water, and the length of the longeſt of all the Filaments of Water. For the Product of the Orifice and the Velocity of the running Water, is equal to the Sum of the Factors of the Sections of the Filaments, drawn ſeverally into the reſpective Velocities. And the Sum of all theſe Factors, drawn into the length of the longeſt Filament, is greater than the Sum of the ſame drawn each into it's own length.

2. The Motion of the Water is equal to the Product of the Orifice A and the Velocity of the running Water, drawn into ſome mean Length between the lengths of the longeſt and ſhorteſt Filaments; or is equal to the Product of the quantity of Water iſſuing in a given Time, and the aforeſaid mean length apply'd to that given Time.

3. If ſeveral ſimilar Machines full of Water are alike contracted, or with a mean Velocity either equable or inequable, yet ſimilarly increaſed or diminiſhed in all the Machines; the Motion by which the Water guſhes out of the Orifice of any Machine, has a Ratio compounded of the quadruplicate Ratio of any homologous Diameter of that Machine, and the reciprocal Ratio of the Time, in which the Contraction of the Machine is perform'd: Or a Ratio compounded of the Ratio of the weight of the Machine, or of the quantity of Water either contain'd in the Machine or expell'd from the ſame, the Ratio of the ſame Weight or the ſubtriplicate of the quantity, and the reciprocal Ratio of the Time.

A **Problem.** *To find the Power of the Heart.*

Make $p=$ To the weight of the left Ventricle, or a quantity of Blood equal to the ſame weight.
$S=$ The internal Surface of the ſame.
$l=$ The mean length of the Filaments of Blood iſſuing from the ſame.
$s=$ The Section of the Aorta.
$q=$ Quantity of Blood contained in the left Ventricle.
$t=$ Time in which the Blood would be expell'd from the Heart, taking away the Reſiſtance of the Arteries, and of the Blood going before.
$v=$ Variable Velocity with which the Blood iſſuing from the Heart would flow through the Aorta, abſtracting from the Reſiſtance.
$x=$ The variable length of the Aorta, deſcribed by the Blood guſhing from the Heart.
$z=$ Time in which the lengh x is deſcribed.

Hence the mean variable Velocity of the Blood contiguous to the Ventricle, or the mean Velocity of the Ventricle itſelf, is $=\frac{sv}{S}$.

The Motion of the Ventricle (by *Theor.* 1. *Cor.* 2.) $=p\times\frac{sv}{S}$.

The Motion of the iſſuing Blood (by *Theor.* 2. *Cor.* 2.) $=sv\times\overline{l+x}$.

The Sum of theſe, or the Power of the Ventricle, $=sv\times\frac{p}{S}+l+x$.

But it is $v=\frac{\dot{x}}{\dot{z}}$. Whence by *Newton*'s inverſe Method of Fluxions, the Power of the Ventricle will be found $=\frac{sx}{z}\times\overline{\frac{p}{S}+\frac{x}{2}+l}$. Now ſince it is $z=t$, it will be $sx=q$.

Hence the Power of the Ventricle $=\frac{q}{t}\times\overline{\frac{p}{S}+\frac{q}{2s}+l}$.

In the ſame manner the Power of the right Ventricle will be found $=\frac{q}{t}\times\overline{\frac{\pi}{\Sigma}+\frac{q}{2\sigma}+\lambda}$.

Here the ſame things are ſignified by the Greek Letters in the right Ventricle, as by the Latin Letters in the left.

Hence the whole Power of the Heart

$$=\frac{q}{t}\times\overline{\frac{p}{S}+\frac{\pi}{\Sigma}+\frac{q}{2S}+\frac{q}{2\sigma}+l+\lambda}.\ \textit{Q. E. I.}$$

If we ſuppoſe
$p=8$ Ounces Averdupois. $=13.128$ Cubic Inches.

$\pi = 4$ $= 6.564$
$S = 10$ ſquare Inches.
$\Sigma = 10$
$l = 2$ Inches.
$\lambda = 1\frac{1}{2}$
$q = 2$ Ounces Averdupois. $= 3.282$ Cubic Inches.
$s = 0.4185$ ſquare Inches } By Dr *Keil*'s Experiments.
$\sigma = 0.583$ }
$t = 0''.1$. }

The Power of the Ventricles will be equal to the Motion of the underwritten weights. That is

	Pounds.	Ounces.
Of the left Ventricle — — —	9	1
Of the right Ventricle — — —	6	3
Of the whole Heart — — —	15	4

Of which weights the Velocity will be ſuch, as that a Line of an Inch long might be deſcribed by the ſame in a Second.

Corol. 1. As often as the Pulſe becomes quicker, either the Reſiſtance is leſſen'd, or the Power of the Heart is increaſed, or a leſs quantity of Blood than uſual is expell'd by the Heart at each Contraction.

2. If the Pulſe becomes ſlower than uſual, either the Reſiſtance is increaſed, or the Power of the Heart is diminiſhed, or a greater quantity of Blood is thrown out of the Heart.

3. When the Reſiſtance is increaſed, the Pulſe will neceſſarily become ſlower, or the Power of the Heart will be increaſed, or a leſs quantity of Blood than uſual will be ſqueezed out of the Heart.

4. When the Reſiſtance is leſſen'd, either the Pulſe is accelerated, or a greater quantity of Blood is thrown out at every Syſtole, or the Power of the Heart is diminiſh'd.

5. If the Power of the Heart is increaſed, either the Reſiſtance will neceſſarily be increaſed, or the Pulſe will be accelerated, or more Blood will be thrown out by the Heart.

6. If the Power of the Heart is diminiſhed, either the Reſiſtance will neceſſarily be diminiſhed, or the Pulſe will become ſlower, or leſs Blood will be ſqueezed from the Heart.

7. When a leſs quantity of Blood is diſcharged by the Heart, either the Pulſe will be accelerated, or the Force of the Heart diminiſhed, or the Reſiſtance will be increaſed.

8. When more Blood is ſqueezed out of the Heart, either the Pulſe will become ſlower, or the Power of the Heart will be increaſed, or the Reſiſtance will be diminiſhed.

Schol. 1. We have contented ourſelves to eſtimate the internal Surfaces of the Ventricles ſomething near the Truth, ſince it ſeems very difficult to determine them exactly, or to take account of that diminution they muſt undergo in contracting. For whether we make them 12 or 8 ſquare Inches, the change made in the Powers would be found to be but very little. This alſo may be obſerved of the mean length of the Filaments of Blood. We have alſo neglected the differences by which both the Arteries, and their Branches neareſt the Heart, are increaſed by *Section*, as being very difficult to be eſtimated, and almoſt inſenſible. Otherwiſe the Power of the Heart muſt be made ſomething ſmaller than is above determin'd.

2. The learned Dr *James Keil* has determin'd the Velocity of the Blood ruſhing out of the Heart, when the Reſiſtance is removed, to be about the ſame as that wherewith 6 $\frac{1}{2}$ Feet, would be deſcribed in a Second of Time. Now he makes the Velocity of the Blood to be equable through the whole Syſtole, which we have ſhewn above, to be notably unequal, and to be continually retarded from the Beginning of the Syſtole. If any one pleaſes to aſſign this, in the fourth Equation before, he muſt ſubſtitute the Power of the Ventricle laſt found, and any Value muſt be given to x, ſo that v, or the correſponding Velocity, may be diſcover'd. Thus, ſince at the Beginning of the Syſtole, 'tis $x = o$, and at the End $x = \frac{q}{s}$; the Velocity of the Blood at the Beginning of the Syſtole is determin'd to be ſuch, as that 14 $\frac{1}{4}$ Feet may be deſcribed, and at the End 4 $\frac{1}{3}$, in a Second of Time. In the like manner in the right Venticle, the initial Velocity of the Blood will make about 10 $\frac{5}{6}$, and the final Velocity 3 Feet, in the ſame Space of of Time.

Hitherto we have proceeded on the Suppoſition, that the Muſcles of the Heart, conſtituting the Ventricles, conceive in a moment of Time all their Motion, by which they perform their Contraction. Now if we ſuppoſe their Motion to be communicated to 'em, not indeed in an Inſtant, but yet in ſo ſmall a Space of Time, that it bears a very ſmall Proportion to the whole Duration of the Syſtole; the Power of the Heart muſt be made ſomething greater than is determin'd above. Now as the Syſtole proceeds, if that Motion is ſuppoſed to increaſe in the Ratio of the Time; the whole Motion acquired at the End of the Syſtole, will be as great again as we have ſuppoſed above, where no Reſiſtance is oppoſed to the Blood iſſuing out of the Heart. But when the uſual Reſiſtance is admitted, it will be five times greater; as will eaſily appear from Calculation. By a like Argumentation, our Calculus may be apply'd to any other Hypotheſis, in which the Motion of the Ventricles increaſe in a duplicate, or any other higher Ratio of the Times. The Power acquired at the End, will come out much greater than that above, that is, a triple Power in the duplicate Ratio, a Quadruple in the Triplicate, a Quintuple in the Quadruplicate, and ſo on *in infinitum*.

But to me, the ſecond *Hypotheſis*, in which the Ventricles acquire their whole Motion in a very ſhort Space of Time, ſeems to be far the more probable; ſince it is neceſſary that ſome time muſt be imploy'd to generate any Motion, nor does the Motion of the Ventricles increaſe ſo ſlowly, as not to increaſe ſwifter than according to the Ratio of the

Time. For the Motion of the Muſcles cannot be perform'd by the Impetus only of any Fluids that proceed from the Blood, ſince with either of our Arms, we can exert a Motion which is far greater than the Motion of the Blood flowing through all the Veſſels of the Body. It remains therefore, that the Fibres of the Muſcles conſtituting the Ventricles of the Heart, muſt be put into Motion by ſome Rarefaction of the Liquors flowing into the ſame. But this, whenever it acquires a great Force, is commonly ſudden and almoſt inſtantaneous. To which add, that a far leſs Motion of the Ventricles is produced according to this *Hypotheſis* than in the Third. But the moſt wiſe Artiſt, the Creator of all Things, in all his Works, makes uſe of no more Force than is neceſſary to compleat his Deſign.

But whether this Hypotheſis is admitted, or any other of thoſe abovemention'd may be thought nearer the Truth; all our *Corollaries* with equal Reaſon may be deduced from the *Problem.* Which whether they may be of any Aſſiſtance in explaining the Hiſtory of Diſeaſes, I muſt leave to the ſagacious Phyſicians to conſider. Now from the Nature of every Diſeaſe, it may be eaſily known, whether the Reſiſtance is increaſed or diminiſh'd. But it is probable that the Force of the Heart will be either increaſed or diminiſhed, when the Force of the other Muſcles is increaſed or diminiſh'd: Tho' I ſee the learned *Laurence Bellini* is of another Opinion.

Theorem III. The whole Motion of Reſiſtance, which is oppoſed to the Blood iſſuing out of the Heart, during it's Syſtole, or the whole Motion which is communicated to the precedent Blood, and the Coats of the Arteries, is nearly equal to the whole Power of the Heart.

Demon. The Syſtole of the Heart being compleated, the Part of the *Aorta* and *Pulmonic Artery*, which is neareſt the Heart, continues full of Blood through the whole Syſtole of the Arteries. Nor does their Fabrick permit, or the Ligaments by which they are join'd to the Heart, that the Coats intirely falling together, they ſhould be wholly ſhut up, or their Cavity ſhould be void of Blood. For thus the other Parts of the Arteries contracting themſelves, the Blood contain'd in the ſame would be repell'd backwards into the Vacuity, by a Motion which is not only uſeleſs, but contrary to the natural Motion of the Blood. Then alſo, the little ſemilunar Valves would not be diſtended towards the Ventricles, ſo that the Blood ſqueezed out of the Auricles into the Ventricles, would be protruded into the Arteries, even in the Diaſtole of the Heart.

Hence it appears that the Blood newly expell'd from the Heart, at the finiſhing of the Syſtole, will continue unmoved in the Arteries, and ſo not only receive the whole Motion of the Ventricles, but alſo communicate the whole, partly to the antecedent Blood, and partly to the Tunics of the Arteries. Q. E. D.

Theorem IV. The Motion which in the Syſtole of the Heart, is communicated to the antecendent Blood, is to the Motion communicated to the Coats of the Arteries, as the Time of the Syſtole of the Heart, to the Time of the Diaſtole very nearly.

Demon. Whereas the Blood flows with an equable courſe through all the Veſſels of the Body, excepting thoſe Parts of the Arteries which are neareſt the Heart; it is neceſſary, that both the Motion that is loſt by the Friction of the Blood againſt the Sides of the Veſſels, as alſo the Motion given to the Blood by the Syſtole, either of the Heart or the Arteries, muſt be equal in equal Times. But the Motion which is communicated to the Blood by the Syſtole of the Arteries, is exactly the ſame which before had been impreſſed on the Coats of the Arteries by the Syſtole of the Heart, ſince the Arteries are again reſtored with the ſame Impetus with which they were diſtended. And the Syſtole of the Arteries is of the ſame Duration as the Diaſtole of the Heart. Whence the Propoſition is manifeſt. Q. E. D.

Cor. If we ſuppoſe with the very learned Dr *James Keil*, that the Syſtole of the Heart is perform'd in a third Part of the Time intercepted between two Pulſes; the Motion communicated to the preceeding Blood, will be a third Part of the whole Power of the Heart. But the Motion communicated to the Arteries, will be double the foregoing, or two third Parts of the whole Power of the Heart.

Theorem V. In different Animals, the Power of the Heart is in a Ratio, compounded of the quadruplicate Ratio of any homologous Diameter of the Animal, and the inverſe Ratio of the Time, in which the Heart is contracted; or in a Ratio compounded of the Ratio of the Weight of the Heart, or of the whole Animal, of the ſubtriplicate Ratio of the ſame, and the reciprocal Ratio of the Time of Contraction.

It is eaſily demonſtrated, either from *Carol.* 3. *Theor.* 1. and 2. or from the Power of the Heart determined by the foregoing *Problem.*

Corol. 1. If we ſuppoſe the Power of the Heart, to be as the Weight either of the Heart it ſelf, or of the entire Animal, or as the Quantity of Blood in the whole Animal; the length of the Animal will be as the Time in which the Syſtole of the Heart is perform'd, or in the inverſe Ratio of the Frequency of the Pulſes.

2. If the Ratio of the Length of the whole Animal, is greater than the inverſe Ratio of the Frequency of Pulſes, the Ratio of the Power of the Heart, will neceſſarily be greater than the Ratio of the Weight of the ſame.

Schol. Since is appears by Experiment, that the Pulſes of Children are not ſo much more frequent than the Pulſes of Men, as Children are exceeded in length by Men; we muſt conclude, by Virtue of the ſecond *Corollary*, that the Power of the Heart of a Man, has a greater Ratio to the Power of the Heart of a Child, than in the Ratio of their

Weights. And the like obtains in the other Muſcles. For if the Strength of the Body obſerved the Ratio of it's Weight, Children might travel equal Journies in the ſame Time as Men.

By a like reaſoning, as we have determin'd the Motion of the Blood iſſuing out of the Ventricles of the Heart, by help of the ſecond *Theorem*; the Motion of the Urine flowing out of the Urethra, may be alſo determin'd. For if we ſuppoſe the Length of the Uretha and Bladder to be equal to 12 Inches, and 2 Ounces of Urine to be diſcharg'd in the Space of a Second; the Motion of the Urine flowing out, will be equal to the Motion of the Weight of $1\frac{8}{2}$ Pounds, which deſcribes the Length of an Inch in a Second. But becauſe the Urine is expell'd not only by the contracting Force of the *Urinary Bladder*, but alſo by the Aſſiſtance of the *Diaphragma* and the *Abdominal Muſcles*; the Power of the Bladder cannot be eſtimated by the Motion of the flowing Urine.

Anſwer'd by Dr James Keil, *n.* 361. *p.* 995.

2.] The great Fault that Dr *Jurin* objects to *Borelli*, D. *Moreland*, and myſelf is this, that in eſtimating the Power of the Heart, we have undertook to determine, what Ratio it bears to a Weight at Reſt; or to the Gravity of a Body. He ſays that, "Whereas the Heart itſelf is in Motion while it contracts and communicates Motion to the Bodies oppoſing it, that is the Blood and the Tunicks of the Arteries; it is plain it cannot be known how great it's Power is, any other Way than by making known the Quantity of this Motion. But any Motion can no more be compared with a Weight at Reſt, than a Line can be compared with a Rectangle." But none of us, that I know of, has compared the Motion of the Heart with a Weight at Reſt. But I cannot ſee what ſhould hinder us from comparing the Power of the Heart, or the motive Force of the Heart, and the impelling Blood, with a Weight. For though between a Weight and the Motion of a ſolid Body there is no Relation, yet the motive Force, if it acts upon a Fluid, ſurely has ſome Relation to the Force of Gravity. And indeed the motive Force of a Body, producing in a given Time, a certain Quantity of Motion in the Fluid, is equal to a Weight, which falling by the Force of Gravity, acquires the ſame Quantity of Motion in the ſame Time. Hence that Force, by which Water is preſſed through any Orifice, is ſaid to be equal to a certain Weight: Becauſe the given Weight, and the Force preſſing out the Water, in equal Times, produce equal Motions. This ſeems to me, to be the genuine Senſe of *Newton*'s *Corollary*, nor does what I have explain'd, concerning the Power of the Heart, differ from this Senſe. *Newton*'s Words are, "The Force by which the whole Motion of the iſſuing Water may be generated, is equal to the Weight, *&c.*" To this Dr *Jurin* ſeems not ſufficiently to attend, when he ſays, "But that Weight, by which the Motion of the Water flowing out of the Veſſel may be generated, *&c.*

But if we have erred in this matter, we have erred with the greateſt Geometricians of this Age, *Huygens* and *Newton*, each of whom has expounded the Force of Fluids by the Force of Gravity. Nor does *Newton* do this only in the aforeſaid *Corollary*, but in other Places alſo he ſhews a Method, by which the Ratio of the Reſiſtance of a Medium, that is, of the Action of a Fluid on a ſolid Body, to the Force of Gravity, or a Centripetal Force may be found; as may be ſeen in *Prop.* 4 & 5 of his ſecond Book, and their *Corollaries*. Indeed the Action of Fluids upon a Solid is one Thing, and the Action of Solids upon one another, is another Thing. A Fluid moving with a given Velocity, may ſuſtain a given Weight, when the Parts of the Fluid continually ſucceeding one another impinge upon the Weight, and ſo the Force of the Fluid is really equal to the Weight. But ſince it is not ſo with Solids, their Force cannot be compared with Gravity.

Beſides this very ingenious Perſon reproves me, becauſe I have ſuppoſed the Velocity of the Blood, expell'd by the Heart, to be equal through the whole Syſtole, which he has demonſtrated to be very unequal. But I have no where given an equal Velocity to the Blood, but for the Sum, I have taken the mean of all the Velocities. But it does not yet appear to me, whether the Celerity of the Blood ejected out of the Heart is equal or unequal; at preſent that Opinion which makes for the equal Celerity ſeems the more probable.

But having cleared up the Blemiſhes which this learned Man has found in my firſt Method, let us ſee what has diſpleaſed him in the other which is ſubjoyn'd. This is the Aſſumption which is made uſe of by *Borelli*, and other learned Men, that in ſimilar Muſcles, the Force is as the Weights. Dr *Jurin* endeavours to eſtabliſh another Proportion of the Forces, in his fifth *Theorem*; but ſince the Demonſtration is derived from the common Principle of all his *Theorems*, it will alſo be involved in their common Fate. For if that Principle is fallacious, as it ſeems to me, nor is adapted to the Caſes to which it is apply'd; every thing muſt fall which is built upon this Foundation. This learned Man ſuppoſes, that the Coats of the Veſſels ruſh with violence upon the Blood contained within, and by their Stroke to communicate to the Blood a Part of it's Motion; and here in the Motion of the Heart, he would have the Ventricle as a ſolid Body, moving with a given Velocity, to impinge upon the Blood, and by it's Stroke to communicate a Part of it's Motion to it: Which Suppoſition agrees neither to the Motion of the Blood, nor of the Heart, nor of the Air ſqueez'd out of the Lungs, nor by any Reiteration of ſmall Strokes can be ſo accommodated to the Motions of theſe, but that the Concluſions drawn from hence muſt be held as uncertain, and altogether falſe.

Since between the Blood and the inſide of the Heart, no Space intercedes, but one is contiguous to the other; this cannot act upon that by a Stroke, but by Preſſure. Nor have the Venticles any Velocity at the

Structure of the Heart, or of the Nature and Force of the contracting Cauſe; nothing is left but to eſtimate the ſame by it's Effects, or *à poſteriori*.

The whole Action of the Heart conſiſts in the Contraction of it's Ventricles. But the Ventricles in contracting urge the Blood, and by communicating a part of their Motion to it, drive it out with a great force where it can find a paſſage. Thus the Blood being forced into the Arteries, the Aorta and Pulmonic, and ruſhing with Violence every way, it impinges partly upon the Tunicks of the Arteries that are fallen and lank from the foregoing Syſtole, and partly upon the Blood that went before now flowing but ſlowly. Whence by degrees the Tunicks of the Arteries are thruſt outwards, and the foregoing Blood is accelerated in it's courſe. Now if we conceive in our Minds that the Arteries are diſtinguiſh'd by very ſmall tranſverſe Sections; at the firſt ſmall portion of Blood ruſhing from the Heart into the firſt Section, that Section will be partly diſtended, and partly the Blood before contained in the ſame will be thruſt into the next Section, which it will alſo diſtend, and thus this Action will be continued through the ſucceeding Sections of the Arteries. Then the ſecond and third and following little portions of Blood will fall upon the firſt Section of the Artery, and will dilate it ſomething more, and propel the Blood contained in the ſame into the next Sections ſucceſſively; and thus it proceeds till all the Blood is ejected out of the Ventricles. But this muſt be obſerved, that the more contracted and flaccid the Arteries are, ſo much the leſs reſiſtance they give to their Dilatation; and the more dilated they are, ſo much the more they withſtand a farther Dilatation. And therefore the Force of the Blood guſhing out of the Heart at firſt is more expended upon the Diſtention of the Arteries, than upon the protruſion of the foregoing Blood; but at laſt the antecedent Blood is more propell'd than the Arteries are diſtended, becauſe being already become rigid, 'tis with difficulty they admit any farther Diſtention.

Now as the Blood ruſhing out of the Heart communicates part of it's Motion (as ſaid before) to the Tunicks of the Arteries, and part to the foregoing Blood, it muſt needs abate of it's former Velocity. And therefore as it hinders the Contraction of the Ventricles, it receives a new Impulſe from them, part of which it impends on the Coats of the Arteries and the foregoing Blood, in the manner before deſcribed; whence it is again retarded, and receives another Stroke from the Ventricles, and ſo on till it is all expell'd out of the Ventricles.

Beſides the cauſe already explained there is ſtill another, by which the Blood flowing out of the Heart is retarded by degrees, and ſo receives new ſtrokes ſucceſſively by the Ventricles contracting themſelves. For as the Blood flows into the Aorta, if it is ſuppos'd to meet with no Reſiſtance at all, and ſo to ſuffer no diminution of Motion, yet it muſt continually increaſe in length as it paſſes from a wide into a narrow place, till the whole is come into the Aorta: And as the Section of the

Aorta is not leſſen'd, the Velocity of the Blood muſt neceſſarily be leſſen'd. For the Motion of the Blood is in a Ratio compounded of the Ratio of the Section of the Aorta, of the Velocity in the ſame, and of the length of the Column of Blood, by our third Theorem concerning the Motion of running Waters. And ſince that portion of the Blood, which is already come into the Aorta, will be gradually retarded, the Blood will thence be retarded which is ſtill in the Ventricle, and hence the Contraction of the Ventricle itſelf will be retarded. Whence the Ventricles will continually communicate another and another part of their Motion to the contiguous Blood, which for theſe reaſons is conſtantly retarded. Now hence it appears (to take notice of it by the bye), that the Motion of the Blood iſſuing out of the Heart is one thing, and the Motion of the ſame already expell'd out of the Heart, and flowing within the Arteries, is another thing. Alſo the Stroke or Impulſe of the Ventricles impreſs'd upon the Blood, which otherwiſe would be but one, and would be perform'd in an Inſtant of Time, yet is continued through the whole Syſtole of the Heart, by the Force of the Cauſes mention'd above, by which the Blood is perpetually retarded.

See above Vol. IV. C V. §. iv.

Therefore we may conſider each of the Ventricles of the Heart impelling the Blood, as a given Body impinging with a given Velocity upon another Body at Reſt, to which part of the Motion being communicated, both the Bodies will move forwards with a common Velocity. Now the Power of the ſame will be equal either to the Product of the weight of the Ventricle and its initial Velocity, before it impinges upon the Blood; or to the Sum of the Motions of the Ventricle and the Blood iſſuing out of the ſame, and of the Motion which is communicated to the Coats of the Arteries and the foregoing Blood; or elſe, if we ſuppoſe there is no Reſiſtance from the Arteries and the foregoing Blood, to the Sum of the Motions of the Ventricle itſelf and the iſſuing Blood.

Theorem I. *The Motion by which a Machine is contracted which is hollow and unequally contractible, is equal to the Sum of the Products of the ſeveral Particles of the Machine, drawn into their Reſpective Velocities.*

This is plain from Mechanicks.

Corol. 1. The Motion of a Machine is leſs than the Product of the weight of the Machine, drawn into the Velocity of thoſe parts of the Machine that are moved ſwifteſt of all in the Contraction.

2. The Motion of the Machine is equal to the Product of the weight of the ſame, drawn into ſome mean Velocity between the Velocities of thoſe parts of the Machine which are moved ſwifteſt, and of thoſe which are moved ſloweſt of all.

3. If ſeveral ſimilar Machines are contracted ſimilarly, with a mean Velocity which is either equable or inequable, yet is ſimilarly increaſed or diminiſh'd in all the Machines: The Motion by which each Machine

is

which of us has underſtood *Newton* beſt. Nor has my learned Adverſary explained his Opinion ſo clearly, but that there may be danger of affixing a Senſe to it, which if he were ſtill alive he might diſclaim. But it may be convenient to obſerve this, that whereas Dr *Keil* ſpeaks of the Force with which Water is impreſſed thro' any Orifice; *Newton* has not mentioned a Word in that *Corollary*, in which Water is ſignified to be thrown out by any Force. He has only determined a Weight equal to that Force, by which the whole Motion of the running Water may be generated, or which, falling by the Force of Gravity, may acquire a Motion, which is equal to the Motion of the Water running out in the ſame Time.

Now the learned Reader will eaſily perceive, that if this grea Man has not miſunderſtood this *Corollary*, yet ſurely he has not rightly applied it; he muſt conſider what difference there is between the Efflux of Water, at a Hole in the bottom of a Veſſel which is always full, (in which manner it is conſidered by *Newton* in that *Corollary*) and the Efflux of Blood out of the Heart into the Aorta. For in the firſt Caſe, the Water has already acquired it's whole Velocity, and for a given ſpace of Time it flows equably out of the Hole. But the Force of the Heart, by Dr *Keil*'s Hypotheſis, is apply'd to the Blood at Reſt in the Ventricle, and propels it towards the Aorta, with an infinitely ſmall Velocity in the firſt Moment of Time; but the equable Preſſure being continued, at laſt it impreſſes a finite Velocity to it, and continually increaſes it, till it has expelled all the Blood out of the Ventricle.

Again, in *Newton*'s Caſe, the Motion is conſider'd, not indeed of the whole Water contained in the Cataract, which is all in Motion, and tends towards the Exit with different Velocity but of the Water only now at the Hole, and juſt going out. But the Force of the Heart impreſſes a Motion to the whole Maſs of Blood contained in the Ventricle, and drives the whole towards the Aorta.

Laſtly, we deny that a Weight of five Ounces, as determin'd by Dr *Keil*, can acquire by the Force of Gravity in a Syſtole of the Heart, ſuch a Quantity of Motion as the Power of the Heart produces; even granting him that Hypotheſis, that the Power of the Heart conſiſts in equable Preſſure. For by this Hypotheſis, the Motion produced by the Force of the left Ventricle, according to our Calculation [*], will be equal to the Motion of about 18 Pounds Weight, which deſcribes the Length of an Inch in a Second. But the Force which a Weight of five Ounces will acquire by the Force of Gravity, in the tenth Part of a Second, or during one Syſtole of the Heart, (if all the Reſiſtance of the Arteries, and the foregoing Blood be taken away) will be nearly equal to the Motion of a Weight of 12 Pounds, which moves with the Velocity aforeſaid. Now aſſuming this Hypotheſis, if any one has a mind to determine the true Weight, which is equal to the Power of the Heart; he will find by Calculation, the Weight of about

[*] See above.

about 7 ½ Ounces. For this will nearly acquire the ſame Motion by falling, during the Syſtole of the Heart, that the Power of the Heart itſelf produces.

But perhaps it may be reply'd, that the Difference here aſſigned between the Motion acquired by the Weight of Dr *Keil*, and the Motion ariſing from the Power of the Heart, may proceed from hence, that poſſibly theſe Suppoſitions may not be very accurate, by which we have reduced to Numbers, the Algebraical Symbols made uſe of in our Calculation. To ſatisfy which Scruple, and to ſhew at the ſame Time that we ſhould find a much greater Difference, had not theſe Poſitions been very favourable to Dr *Keil*, it may be worth while to have recourſe to ſome ſimple Caſe, in which a given Quantity of Water is ſqueez'd through a given Orifice, in a given Time, by ſome equable Force or Preſſure, which are the Conditions ſuppoſed by the Adverſary, for defining the Power of the Heart.

Now in this Caſe we ſhall demonſtrate, that neither the Motion of running Water, nor the Motion impreſſed to the whole Quantity of Water by that Force, will be equal to the Motion of the Water in the *Corollary* of *Newton*; nor will that Force or Preſſure, be equal to the Weight determined by that *Corollary*. Which if we ſhall perform, Dr *Keil*'s whole Demonſtration muſt entirely fall to the Ground.

We will aſſume therefore a given Cylinder of Water, contained in a Cylindrical Tube of indefinite Length; and that Section of the Tube will be inſtead of an Orifice, to which either Superficies of the Water reaches, and to the other Superficies a Force may be apply'd, by means of a Piſton of the ſame Diameter as the Tube itſelf. Now in a given Time, let any given Quantity of Water flow through the ſaid Section of the Tube; then another equal Quantity through a Hole made with an equal Diameter in the bottom of the Veſſel, which in *Newton*'s Manner ſtill continues to be full. And in the firſt Place let us examine, whether in both Caſes there will be equal Motions of the running Water.

Let the Time of the Efflux of the Water, be expounded by the right Line A C, and the equable Velocity with which the Water runs out at the Hole in the bottom of the Veſſel, be expounded by the right Line A B. Whence the Quantity of Water flowing out at the Hole, being as the Time and Velocity conjunctly, will be expounded by the Rectangle A B C D. And the Motion of the ſame will be expounded by the ſolid Parallelepiped, made on the ſame Rectangle, drawn into the Height A B, at being in a Ratio compounded of the Ratios of the Quantity and Velocity. Fig. 147.

In the other Caſe, wherein the Water flows through the Cylindrical Tube, the Time (as before) will be expounded by the ſame right Line A C, but the Velocity of the Water will be as the Time, for the Force apply'd acts equably upon a given Quantity of Water, by the Hypotheſis, and therefore will be repreſented by the variable Line F G, proportional to the right Line A F, or to the Time from the Beginning of the Efflux. But the Particle of Water paſſing through the aforeſaid Section, in the Particle of Time F H, will be expounded by the Rectangle of F H drawn into the Exponent of the Velocity F G; or if the little right Line F H be conceived to vaniſh, by the Trapezium F G I H, and the Quantity of Water flowing for the whole Time A C will be reprepreſented by the right-angled Triangle A C E. And becauſe, by the Hypotheſis, that Quantity is equal to the Quantity of Water flowing in the former Caſe, the Triangle A C E will be equal to the Rectangle A B D C; whence C E, or the Velocity acquir'd at the End of Time A C, will be double to the Velocity C D or A B, with which the Water flows out of the Hole at the Bottom of the Veſſel. Now whereas the Motion of the Water paſſing in the Particle of Time F H, is in the Ratio of the Quantity and Velocity conjunctly, it will be expounded by the vaniſhing Priſm, which is made of the Trapezium F G I H drawn into the Velocity F G. Whence the whole Motion of the Water flowing in the whole Time A C, will be expounded by the Pyramid, whoſe Baſe is the Square of of the right Line C E, and whoſe perpendicular Altitude is the Line A C. Now as this Pyramid is to the Parallelepiped determined in the former Caſe, as 4 to 3, the Motions alſo of the flowing Water in each Caſe, will be in the ſame Proportion, and therefore unequal; which we undertook to demonſtrate in the firſt Place.

The next Thing is to ſhew, that the whole Motion finally impreſſed on the whole Water contained in the Tube, is not equal to the Motion determin'd in the firſt Example. Now ſince that whole Quantity of Water is not at all determin'd by the foregoing Poſitions, we will here aſſume it to be equal to the Quantity of Water expounded by the Rectangle A B C D, which in the firſt Caſe flows out of the Hole, and in the Second, runs through the aforeſaid Section. Then ſince the whole Motion finally impreſſed to it, is in the Ratio of the Quantity, and the final Velocity conjunctly, it will be expounded by the Parallelepiped made of the Rectangle A B D C drawn into the right Line C E. Now this is to the Parallelepiped determined in the firſt Caſe, made of the ſame Rectangle, and the right Line C D, as the Height C E to the Height C D, or in a duple Ratio. Laſtly, ſince we might have expounded the Quantity of Water contained in the Tube, by any other Rectangle, as well as the Rectangle A B C D; it is plain that this Motion may have any Ratio to the Motion determin'd in the firſt Caſe, and therefore is by no means equal to it. Which was to be demonſtrated in the ſecond Place.

It ſtill remains to be ſhewn, that the Force apply'd in this Caſe, is not equal to the Weight determined by the *Corollary* of *Newton*. Now this Force, and the Force of Gravity acting upon that Weight, ſince they are both equable, will be in the Ratio of the Motions, produced by each in a given Time. But as we have now demonſtrated that theſe are unequal, thoſe Forces will alſo be unequal: Which was the laſt Thing to be demonſtrated.

This learned Man proceeds to that other Fault which I had found in his Solution; which is, that he has ſuppoſed the Velocity of the Blood flowing out of the Heart to be equable, which is demonſtrated by me to be remarkably inequable. Now he denies that he has aſcribed an equable Velocity to the Blood, but only to have uſed a mean Velocity for the Sum of all the different Velocities. Beſides he ſays, that it does not ſufficiently appear to him, whether the Velocity of the ejected Blood be equal or unequal, but the Opinion of an equal Velocity to him ſeems moſt rational. But let the candid Reader judge, if any one pretending to find the Velocity of the Blood, applies the Quantity of the expelled Blood to the Orifice of the Aorta, without mentioning the different Velocities, or the mean Velocity, whether he does not ſuppoſe the Velocity of the Blood to be equable. Let him alſo determine, whether any Force or Preſſure, applied to a Fluid at Reſt in a Veſſel, (for ſuch is the Hypotheſis of this learned Man) will not urge the Fluid in the firſt Moment of Time, with the ſame Velocity as in the laſt Moment.

This learned Man having thus anſwer'd (as he thought) thoſe Objections which I had made to his firſt Method, proceeds to vindicate that his eaſier Method. In this I had obſerved, that he aſſumes this Propoſition, that in different Animals, the Forces of their Hearts are in the Ratio of their Weights; alſo that he ſuppoſed the Velocity of the Blood flowing out of the Iliac Artery when cut, to be equal to that by which the Blood is emitted out of the Heart into the Aorta; both which Poſitions we have demonſtrated to be falſe. This learned Man does not defend the latter Miſtake, but he vindicates the former, by the Authority of *Borelli* and other learned Men, who often make uſe of this Aſſumption. I admit it to be ſo, and therefore have reproved *Borelli* for this Aſſumption. It was therefore incumbent on this learned Man, to take our Demonſtration into Examination. Now he conceives this to depend upon a certain fallacious Principle, on which ſince all my *Theorems* are founded, they muſt all be involved in a common Ruin. For he affirms that I ſuppoſe, that the Ventricles of the Heart, as it were a ſolid Body moving with a given Velocity, impinge upon the Blood, and by that Stroke communicate to it a Part of their Motion. And this Hypotheſis, as this learned Man thinks, can neither agree to the Motion of the Blood, nor of the Heart, nor of the Air ſqueez'd out of the Lungs.

As to what belongs to the Lungs, ſince this learned Man thought fit to mention this by the Way, I acknowledge that I conſider'd the Lungs, as it contracted, to impinge with a given Velocity upon the Air contained in it, and I profeſs I did this on purpoſe. For as not only *Bellini*, but many other very learned Men, among whom my learned Adverſary is not the leaſt, have advanced many Things about that Force, by which in Breathing, the Air acts upon the Blood paſſing through the Lungs, and diſſolves it's grumous Parts; which Diſſolution they imagine to happen at the very Begining of Expiration; I purpoſed to take this their Opinion into Examination. Now I perceived, if I allow'd the Air to be expell'd by an equable Force or Preſſure, that the Motion imparted to the Air by the Lungs at the Beginning of Expiration, or the Reaction of the Air upon the Lungs, and therefore upon the Blood paſſing through, muſt be eſteem'd as an infinitely little Quantity, and therefore could perform none of thoſe Effects which were aſcribed to it. But if I had done ſo, I thought that *Bellini* and his Followers might juſtly complain, that I had not done fairly by them, as having rejected their Opinion on account of a Demonſtration, which was derived from an arbitrary Hypotheſis, the moſt oppoſite to their Sentiments. Therefore I choſe rather to deduce a Demonſtration from ſuch an Hypotheſis, as was moſt favourable to them, and which aſcribed to the Air at the Beginning of Expiration, the greateſt Quantity of Motion. But this was that in which it is ſuppoſed, that at the Beginning of Expiration the Lungs impinge upon the Air with a given Velocity.

But in determining the Power of the Heart, I firſt propoſe that Hypotheſis as the moſt ſimple of all, and deduce my Solution from it, in which the Ventricles with their whole Impetus acquired at an Inſtant of Time, as a ſolid Body endued with a given Velocity, ruſh upon the Blood at once. Then I afterwards conſider that Hypotheſis, in which the the Ventricles of the Heart conceive their whole Motion in a very ſmall Particle of Time, and which ſeems the moſt probable to me. Then I come to Dr *Keil's* Hypotheſis, and infinite others, to all which I accommodate my Solution. So that my Solution will obtain, whether that Principle is uncertain and fallacious, or whether it ſhall be found true and reaſonable.

Yet I ſee nothing of Argument alledged, but that I have as much right to make uſe of this Poſition, as this learned Man has of uſing the contrary, his Force of Preſſure: We cannot deny that there is no Space intervening between the Sides of the Ventricles and the Blood, and yet it does not appear why the Effect cannot be perform'd by a Stroke. Certainly if a Stroke be given to a Cube touching a Globe, the Cube will as eaſily communicate to the Globe a Part of it's impreſſed Motion, as if there were a Space between them.

Now theſe are ſolid Bodies, but when the Queſtion is about the Motion of Fluids, the affair will be very different. Dr *Keil* explains at large the Difference there is between the Strokes of ſolid Bodies, and the Action either of a Solid upon a Fluid, or of a Fluid upon a Fluid: Which Difference as he thinks I did not attend to, he aſſerts that, whatever Errors are in my Propoſition proceed from hence. Now I readily admit this Difference, and that this learned Man has rightly inſiſted on it; and I affirm I was not unacquainted with this common Doctrine, ſince nothing is more frequently met with in Writers upon Mechanicks. Yet I found it neceſſary to explain ſome new Caſes, in which, as that Doctrine could not take Place, a new Method was to be purſued. This may be cleared up in three Words. And to make uſe of an eaſy Example, ſuppoſe a Cylinder of Water of a given Length to be at Reſt in a given Tube, and let another ſolid Cylinder of an equal Diameter move through that Tube, and impinge againſt the Cylinder of Water with a given Velocity. What will be the Effect? Why, the whole Cylinder of Water by that Stroke will be put into Motion, after the ſame Manner as if it had been a ſolid Cylinder, and the other Cylinder would loſe a Part of it's Motion in a Moment of Time, and both Cylinders would move through the Tube with a common Velocity. And juſt ſo it would happen, if the Cylinder of Water flowing through this Tube, ſhould ſtrike againſt the ſolid Cylinder at Reſt. But if the Cylinder of Water ſhould move through the Tube with a given Velocity, and the ſolid Cylinder ſhould meet it with ſome other Velocity, ſo that the Quantities of Motion of the watry and ſolid Cylinder may be equal, the Motion of each Cylinder would be deſtroy'd in a Moment of Time, juſt as if two ſolid Bodies, whoſe Motions are equal, ſhould meet one another. As to any other Caſes more compounded, the learned Reader may find them in our Diſſertation concerning the Motion of running Waters, and he will ſee at the ſame Time how that may be brought about, which ſeems to have been the chief difficulty of my learned Adverſary; that is where I have ſhewn, that the Blood may be ſtopp'd, though it ruſhes with it's whole Impetus out of the Ventricle, when it meets with a ſolid Body which is endued with a given Quantity of Motion.

XIV. *A Paper Omitted.*

A Diſcourſe concerning ſome *Influence* of *Reſpiration* on the *Motion* of the *Heart*, hitherto unobſerv'd. By *J. Drake*, M. D. F. R. S. n. 281. p. 1217.

XV. *Account of a Book Omitted.*

Johannis Conradi Beckeri, Phil. & Med. D. Paradoxum Medico-Legale *De Submerſorum Morte ſine Potâ Aqua*, aliquot Cadaverum ſectionibus detectum, & e Principiis Mechanicis illuſtratum. Cui adjicitur Dodecas Obſervationum circumſtantiis curaque rariſſimarum. *Gieſſæ Haſſorum*, M.DCC.IV. n. 303. p. 2152.

CHAP.

CHAP. V.

The ABDOMEN.

Of Secretions *in an* Animal Body; *by Dr* J. Morland, *n.* 283. *p.* 1292.

I. THE whole Buſineſs of *Secretions* ſeems to me reducible to this double Enquiry: *1ſt*, How a thin Fluid (ſuch as is the *Urine*) may be ſeparated from the Maſs of Blood, and the remaining Parts of the Blood circulate back to the Heart. *2dly*, How a thick Fluid (ſuch as is the *Bile* or *Semen*, for Example) may be ſeparated from the Maſs of Blood, and the other Fluids, both thinner and thicker than this particular Fluid to be ſeparated, circulate back to the Heart. And that I may be the more plain, I ſhall give a general Idea of the Structure of the *Glands*. A *Gland*, I conceiv'd to be compos'd,

1ſt, Of the Ramifications of the Blood-Veſſels inclos'd in a common Membrane, which ſends off ſeveral Fibres, by which theſe minute Veſſels are tied together; and that the Veins are a continuation of the Arteries. Of this Dr *Areſkin* has fully convinced us, by an *Injection of Wax* in an Human Body ſo dexterouſly performed, that the *Wax* being *injected* by the *Arteries* filled the *Veins* at the ſame time; and afterwards by a nice Diſſection of the Part, where the *Continuation* of the ſmall *Ramifications* of the *Arteries* and *Veins* appeared to the naked Eye.

2dly, I conceive, that when the Branches of the Arteries begin to grow very ſmall, they ſend off ſeveral Ducts, whoſe Orifices are of different Dimenſions. Theſe Ducts are of two Sorts.

The Firſt of theſe, which in the ſame Artery are always ſmaller than the *2d*, paſs immediately from the Artery, and open into the Veins.

The Second which paſs off nearer to the Extremity of the Arteries, unite and carry off a Liquor from the Maſs of Blood for particular Ends in ſeveral Parts of the Body. It is to be obſerved, that in one Caſe the ſecond Sort are only to be found.

I imagine, that a thin Fluid may be ſecerned from a thick one, when the Orifices of the ſecretory Ducts are ſo ſmall, as to admit no other but that thin Fluid, and that at the ſame Time the remaining Parts of the Blood which are thicker, continue their Courſe in the Veſſel.

Again, I imagine that a thick Fluid may be ſecern'd, when the thinner Parts are carry'd off ſome other Way, ſo that the Liquor to be ſecerned will be the thinneſt of the remaining Maſs.

Upon theſe Principles I think it will be eaſy to explain the Doctrine of Secretions. And now, *In the firſt Place*, Let us examine how the thinner Secretions are performed: As for Inſtance, the Urine.

When the Blood by the Contraction of the Heart is puſh'd into the Arteries, they are dilated, which again contracting themſelves, puſh it forward into all the Parts of the Body, and amongſt the reſt into the Ramifications of the Arteries of which the Glands of the *Kidneys* are compos'd. By this means the Blood paſſes by the Orifices of the *Secretory Ducts*; when theſe Arteries contract themſelves they preſs the Blood, and force the thinner Parts into the Orifices of thoſe Ducts, which will admit no thicker Fluid, and carry it toward the *Pelvis*, and the remaining Part of the Blood, into the Veins by them to be carry'd back to the Heart. Thus a thin Liquor may be ſeparated from the Maſs of Blood.

In the ſecond Place, Let us examine how a thick Liquor may be ſeparated from the Maſs of Blood where thinner Liquors are mixed with it.

For Inſtance, let us take the *Gall* or *Semen*.

When the Blood is puſh'd into the *Celiac* or *Meſenteric* Arteries, 'tis forced to paſs into the Glands of the *Stomach*, *Pancreas*, *Spleen*, and *Inteſtines*, &c. where the *Liquor Gaſtricus*, *Succus Pancreaticus*, *Liquor Inteſtinalis*, are ſeparated by the above mention'd Method. The Blood thus robb'd of various thin Liquors is puſh'd on into the Veins, which anſwer to theſe Arteries, which Veins unite, and form a large Trunk called the *Vena Porta*, which entering into the Subſtance of the Liver by it's ſmall Ramifications chiefly forms the Glands of which the Liver is compos'd. Here again all the Fluids contain'd in the *Vena Porta*, which are thinner than the Bile, are ſeparated from this Maſs of Blood, by the firſt Sort of Secretory Ducts (which we ſaid opened into the Veins) and there are diſcharged and mixed with the Blood, which is paſſing toward the Heart. At the ſame Time the *Bile*, with the reſt of the Blood which is thicker, continues it's Courſe in the Artery: Now all the thin Liquors being ſeperated, the Bile is the thinneſt Part of this Maſs of Blood, and ſo may be received by Excretory Ducts, which are capable to receive it, and no other.

The *Semen* being a very thick Liquor is ſeparated much after the ſame manner, *viz.* The Blood being puſh'd into the *Spermatick* Arteries, paſſes into the Subſtance of the *Teſticles*, where all the Liquors that are thinner than *that* out of which the *Semen* is to be taken, are ſeparated by the firſt Sort of Secretory Ducts, and carried back to the Maſs of Blood. Then this *Liquor Seminalis* being the thinneſt Part of the remaining Maſs, is ſeparated by Excretory Ducts, capable to receive it, and no other. After the *Liquor Seminalis* is ſeparated from the Maſs of Blood by the aforeſaid Method, it is puſh'd forward into the Excretory Ducts, where there are other Ducts, which take their Origin all along from them, which Ducts are capable to receive the thinneſt Parts of the *Liquor Seminalis*, and convey them to the Maſs of Blood: And thus the *Semen* is left behind to paſs into the *Vas deferens*.

And 'tis worth remarking, that as the *Semen* grows thicker and thicker, by continual Separation, the Canal in which it is to run, grows larger and larger; as appears by the Structure of the *Teſticles*, *Epididymis* and *Vas deferens*. Hence we may give a true Account, why the Canals of which the Teſticles are compoſed, are ſo long, *viz.* That there might be time enough to ſeparate all the thin Fluids,

By this Method we ſee, how the thickeſt and thinneſt Fluids may be ſeparated from the Maſs of Blood. And how intermediate Liquors may be ſeparated after the ſame Manner by Canals of intermediate Dimenſions.

Thus, in a Word, the whole Doctrine of Secretions may be reduc'd to this.

To ſeparate a Liquor of any determin'd Thickneſs, all the Fluids, which are thinner, muſt be carry'd off by ſmall Canals, and the Liquor to be ſeparated, being the thinneſt of the remaining Maſs, is ſecerned, becauſe the Ducts are capable to receive it, and no other.

Corollaries. 1. Hence the Uſe of the Spleen is evident.

2. Hence appears the Origin and Uſe of the Lymphatics.

3. Hence the Texture and Uſe of many minute Parts of the Body may be diſcover'd, which hitherto has been unknown.

Of the Glands *in the* Human Spleen; *by Dr* J. Douglas. *n.* 349. *p.* 499.

II. *Anatomy* has receiv'd much improvement, from a true Obſervation of what has been found in the Diſſection of *Morbid* Bodies. Thus I have ſeen in a *Diſeaſed* Subject, the *Glands* diſperſed through the fibrous Subſtance of the *Human Spleen*, which in a *Natural* State appear not to the naked Eye: It was in a Boy about 4 or 5 Years old, that died of a general *Atrophy*, or Conſumption of all the muſcular fleſhy Parts of the Body, occaſion'd, without all doubt, from the numerous glandulous Swellings ſcatter'd up and down the whole Meſentery; which, by compreſſing the Lymphatic Veſſels, call'd in this Place *Vaſa Lactea*, prevented the Acceſs and Supply of the Chyle, ſo neceſſary for the continu'd Nouriſhment and Increaſe of the Parts. For without the conſtant Recruit of this Liquor, the Maſs of Blood will in a ſhort time be unfit to perform any of thoſe good Offices, which a freſh Acceſſion of Chyle qualifies it for.

In a Piece of this *Spleen* we might ſee, without the Aſſiſtance of a Glaſs, ſeveral round whitiſh Bodies of a pretty hard Conſiſtence, and abundance of ſmall, white, and ſofter Specks; but both of the ſame Nature. Theſe, to me, at leaſt, appear to be ſo many diſtinct Glands become viſible; which, in a Natural State, are only to be ſeen by a fine Glaſs, as the curious *Malpighius* firſt obſerv'd. (*Vid.* his

Treatiſe *de Liene, cap.* V. *De quibuſdam corporibus per Lienem diſperſis. Minimæ hæ Glandulæ*, ſays he, *non æque facile ſeſe produnt in quocunque animalium Liene: imo ſolâ Lienis laceratione innoteſcunt in Bove, Ove*, &c. *In Homine vero difficilius emergunt: ſi tamen ex morbo univerſum glandularum genus turgeat, manifeſtiores redduntur, auctâ ipſarum magnitudine, ut in defunctâ puellâ obſervavi; in qua Lien globulis conſpicuis racematim diſperſis totus ſcatebat.* Which Caſe was the very ſame with mine.

Two, and Three Spleens, *found in* one Body; *by* Mr W. Cheſelden, *n.* 337. *p.* 282. *Fig.* 148, 149, 150.

III. *Fig.* 148, ſhews three Spleens taken from one Body.

Fig. 149, ſhews two Spleens taken from a Man.

Fig. 150, ſhews two Spleens taken from a Woman.

In all theſe three Caſes of the *Spleens*, each had proper Veſſels; but the Arteries only are expreſſed in the Figures.

The *Spleens* in each Body taken together, were but equal in Magnitude to one we uſually meet with.

Of an Ulcer *in the Right* Kidney; *by* Dr J. Douglas, *n.* 325. *p.* 32.

IV. I aſſiſted lately at the Opening of a Gentleman, who died the Day before, in the 45th Year of his Age; where I obſerved the following Particulars relating to the unuſual Structure and morbid Diſpoſition of the Parts contained in the Cavities of the *Thorax* and *Abdomen.*

When the Skin, with the other Integuments, were taken off, I obſerved, that part of the *Omentum* had thruſt itſelf through the annular Holes of the Abdominal Muſcles on the left Side, and there form'd an *Epiplocele*, or *Hernia Omentalis*, as large as a Walnut.

The *Omentum* reach'd as low down as the *Pubis* and Inſide of the *Ilia*, to which it was ty'd; and by fibrous Connexions it adher'd to all the *Peritonæum* below the Navel.

All the Fat on the *Omentum* and Guts was firm, and hard like Tallow.

The Inteſtines and Stomach were quite empty, without either Wind or *Fæces.*

The left Kidney was much larger than ordinary, being near eight Inches long; it's Surface being divided into ſeveral diſtinct Lobes, as in a *Fœtus.*

The right Kidney was full of a fœtid purulent Matter: All it's inner Subſtance was wholly waſted; and it's external or cortical Part was ſtretched ſo very thin, that a ſmall Touch of the Finger could eaſily break through it.

All the Fat and Glands about the Kidney laſt mention'd were hard, obſtructed, indurate, and big, which made a great Compreſſion on the *Muſculus Pſoas* and the *Muſculus Quadratus Lumborum.*

The Ureter proceeding from this right Kidney was cover'd with a Cruſt or Bed of indurate Glands; and beſides, it's Capacity was ſtraitened and contracted in ſeveral Places.

The Cavity of the *Veſica Urinaria* was very ſmall; it's Subſtance ſo very thick and hard, that I could not even by the help of a Blow-pipe diſtend it any wider: It's Inſide ſeemed excoriated with ſeveral little fleſhy Caruncles, or red Excreſcencies, here and there.

There was a remarkable Corroſion in all the Inſide of the *Urethra*.

All the upper and convex Part of the Liver adhered firmly to the *Peritonæum* that covers the Diaphragm, and to the ſame Membrane where it covers part of the *Muſculus Abdominis Tranſverſalis:* It's Subſtance was ſo very tender and ſoft, that it ſeemed to be almoſt rotten.

The Gall-Bladder was extremely large and full; the bilious Liquor it contain'd, being of a whitiſh-yellow Colour.

Between the *Tunica Vaginalis* and *Albuginea* of the left Teſticle, there was a large hydatical or watery Tumour; and upon the laſt named Coat of the ſame Teſticle there were ſeveral chalky Concretions, about the Bigneſs of a Barley-corn each.

In the right Auricle of the Heart there was a large *Polypus* that fill'd up it's Cavity, extending itſelf a great way into the aſcending and deſcending Trunks of the *Vena Cava*.

All the reſt of the *Viſcera* were as they ſhould be in a Natural State.

The Symptoms this Perſon complain'd of during his Illneſs, as far as I was inform'd by thoſe who attended him, were, that about a Year-and-half ago he began to decline in Health; his firſt Complaints being a Heat, Sharpneſs or Pain in making Water; conſtant Deſire to Urine, though in great Miſery after. When the Water ſtood a while, there appeared a greaſy Subſtance on it's Surface, not unlike the Cream or Ice that is found on the top of *Aqua calcis vivæ*; ſome Time after, it depoſited a purulent Matter in great Quantity, but without any offenſive Smell: The Water when made was thick and whitiſh, but when the Corruption ſettled to the bottom of the Pot, it became clear. He ſeldom complained of any great Pain in his Back or Loins; whence they concluded the Ulcer was in the Neck of the Bladder, tho' the vaſt Diſcharge of Matter was an Argument of the contrary: But he always was on the Rack when he roſe up after ſitting, and it was a great Difficulty to him to get up, which perhaps was occaſion'd by the Weight and Preſſure of the Kidney, and adjacent indurate Glands, lying on the Head of the *Pſoas* Muſcle, and *Quadratus Lumborum*.

He had often a total Suppreſſion of Urine; but was much reliev'd by *Sal Succini* and *Cornu Cervi*. He took ſeveral Doſes of *Cantharides* with *Camphire*, without any ill Effect from the Fly, but with little Relief to his Diſtemper. For three Weeks paſt he was ſeized with a violent Looſeneſs, which at laſt, in Spight of all Means, carried him off.

V. 1.] I have lately read over with great Pleaſure a moſt ingenious little Tract on Fevers. In the Main, I think the Author in the right, that moſt, if not all, Fevers proceed from the Obſtruction of the Glands.

Of Powder'd Blue *paſſing the* Lacteal Veſſels, *by Dr* M. Liſter, *n.* 270. *p.* 819.

In *Page* 54 of that Book, An Experiment of mine (publiſhed many Years ago, † and in the Succeſs of which I thought myſelf very happy) is not fairly repreſented: as, I ſuppoſe, ſtanding too much in his way; and therefore is removed, and paſſed over by him, as if not done by me, or at beſt miſtaken. However it was afterwards experimented at *Oxford* by Dr *Muſgrave* with a ſurprizing Succeſs; *viz.* that a Dog kept long faſting, would not only admit into the Lacteals a tinctured Liquor, but a very ſubſtantial one, ſuch as powder'd Blue.

† *Vid.* Supra V. III. C. IV. §. xxiii.

And therefore to account for Fevers, and the Obſtruction of the Glands, we muſt admit of crude, and otherwiſe vitiated Chyle, as well, if not oftener, than the external Accidents from Cold and Heat, and the diſorderly Temperature of the Air.

2.] The *New Theory of continual Fevers* lately publiſh'd, ſpeaking (*pag.* 54, 55.) of the Experiment of Dr *Liſter*'s of *colouring the Lacteals*, intimating, that the Doctor *could never get the Experiment done to his Satisfaction*——and——*that People may be deceiv'd with Blue Tinctures for* [*that*] *this is the natural Colour of theſe Lacteals when they are almoſt or altogether empty*; I have drawn out of my *Adverſaria* the Sum of what was (after Dr *Liſter*) done by me in that Matter.

On the ſame, by Dr W. Muſgrave, *n.* 275. *p.* 996.

Feb. 1682-3. I injected into the *Jejunum* of a Dog that had for a Day before but little Meat, about twelve Ounces of a Solution of *Indigo* in Fountain Water; and after three Hours, opening the Dog a ſecond time, I obſerv'd ſeveral of the *Lacteals* of a *Bluiſh* Colour; which, upon ſtretching of the *Meſentery*, did ſeveral times diſappear; but was moſt eaſily diſcern'd when the *Meſentery* lay looſe; an Argument that the *Bluiſh* Colour was not properly of the Veſſel, but of the Liquor contained in it.

A few Days after this, repeating the Experiment in another Company, with the Solution of *Stone Blue* in Fountain Water, and on a Dog that had been kept faſting 36 Hours; I ſaw ſeveral of the Lacteals become of a *perfect Blue Colour*, within very few Minutes after the Injection: for they appear'd ſo before I could ſow up the Gut.

About the Beginning of *March* following, having kept a Spaniel faſting 36 Hours, and then Syringing a Pint of a deep Decoction of *Stone Blue* with common Water into one of the ſmall Guts; and after three Hours, opening the Dog again, I ſaw many of the Lacteals of a *deep Blue Colour*. Several of them were cut, and afforded a *Blue Liquor*, (ſome of the Decoction,) running forth on the Meſentery. After this I examin'd the *Ductus Thoracicus*, (on which together with other Veſſels near it, I had, upon my Return, made a Ligature) and ſaw the *Receptaculum Chili*, and that *Ductus*, of a *Blueiſh Colour*; not ſo Blue, indeed as the Lacteals, from the Solution mixing in and near the *Receptaculum*, with *Lympha*; but much *Bluer* than the *Ductus* uſes to be, or than the *Lymphatics* under the Liver (with which I compared it) were.

I truſted not my own Eyes in any one of theſe Experiments; but in each of them had the Company and Aſſiſtance of ſeveral Phyſicians; who all agreed with me as to the Colouring of the Lacteals.

The Entrance into the Lacteals (which is much the narroweſt Part of all the way from the Mouth to the Maſs of Blood) being thus beyond Exception, proved wide enough to admit ſo groſs a Body as *Stone Blue*, we may here in part explain the Admiſſion of Liquors, as of Diuretic Waters, *&c.*) into the Veſſels in *prodigious Quantities* in a very little Time.

The ſame Wideneſs of the *Lacteals* makes them eaſy to receive (together with proper Vehicles) thoſe groſſer Bodies which afterwards compoſe the grumous Part of the Blood, the Cartilages and Bones.

And this open Entrance being allowed, it will no longer ſeem impoſſible, that with our Nouriſhment, Eggs or *Animalcula* themſelves, ſhould enter theſe Veſſels, there being no Manner of Queſtion, but that of both the one and the other, ſome are much leſs in Bulk than the greateſt Particles of *Indigo*, in the Decoction abovementioned ſeen in the Lacteals.

Add to this the many Species that are of little Inſects, and their great Fertility; ſo many and ſo great, that of the People of the Animal Kingdom, a very ſmall Proportion (perhaps not a quarter Part) comes within View of the naked Eye; and then, we ſhall be the better able to account for the great Variety, as well as Numbers of Inſects obſerv'd in the Juices of the Body Animal.

But the chiefeſt Uſe of the Wideneſs of the Lacteal Orifices, is in deducing from thence the Reception of groſs Matters (ſuch as are the Effects of Indigeſtion, *&c.*) which afterwards in the Blood and *Genus Nervoſum*, many Times produce ſevere Diſtempers.

Which Notion, in ſome Degree, was confirmed by it's firſt Propoſer (*vide Clariſſ.* Liſteri *de Fontibus medicatis* Angliæ *Exercitationem alteram, Ed. Lond. pag.* 48.)

A Diſeaſe *caus'd by ſwallowing* Pebble-ſtones, *by Sir* Ch. Holt, *n.* 275. *p.* 995.
† *Vid.* Supra V. III. P. 1. C. iv. §. xvi.

VI. *Gobſill* (whoſe Caſe is printed in the *Ph. Tr.* N. 253.) came lately to me, and told me the Pebble-Stones grew very troubleſome to him; that he had of late vomited up two of them, which he ſhewed me, and I cauſed them to be weighed. One weighed ʒij, and the other ʒj. ℈ijſs. He complains that his Strength is of late much impaired; that he voids great Quantities of Blood by Stool, which keeps him very weak. His Stomach is much decay'd, and will retain but few Things. His Hands are palſied, always extreamly cold, and his Fingers contracted; he is not able to open them without Help, or keep them ſo, unleſs by Force. His Legs are very likely, in a ſmall time, to be as uſeleſs to him as his Hands, for he ſays they begin to fail him, and in the ſame

Fig. 14

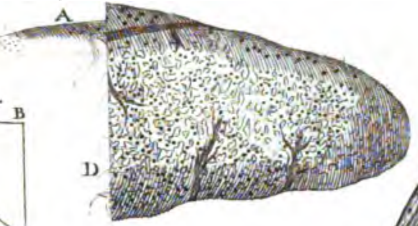
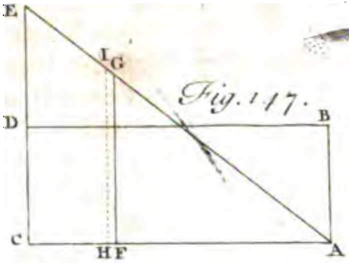


Fig. 147.



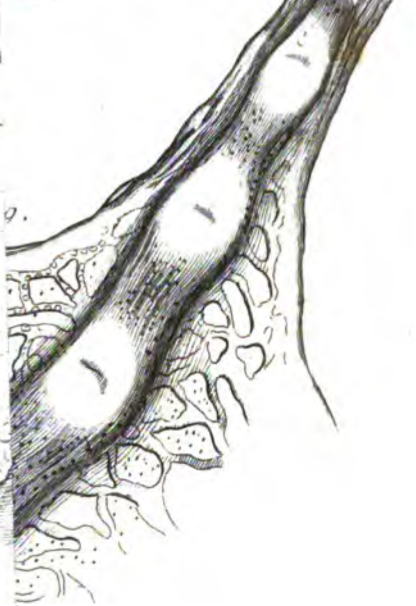


Fig. 146.

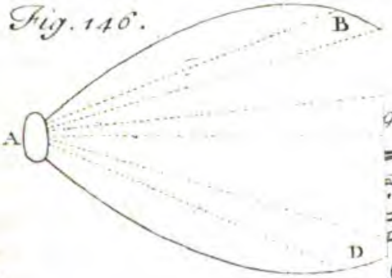


Fig. 144.

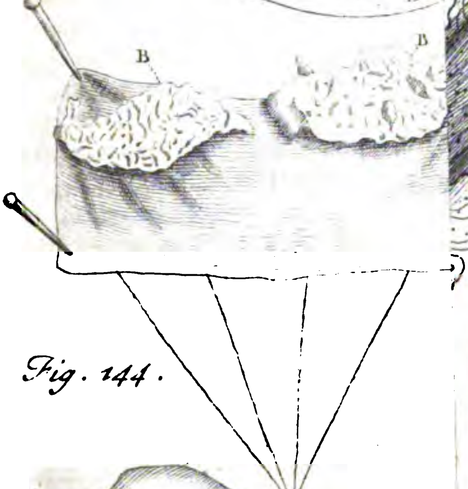


Fig. 148.

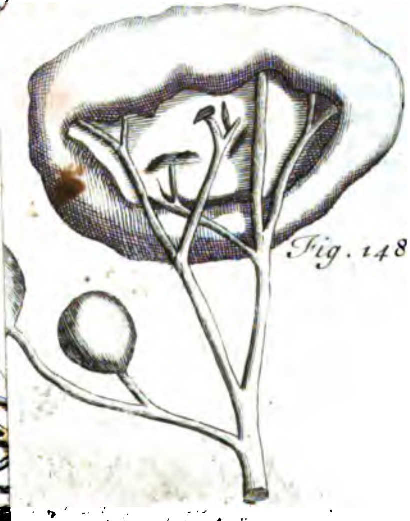
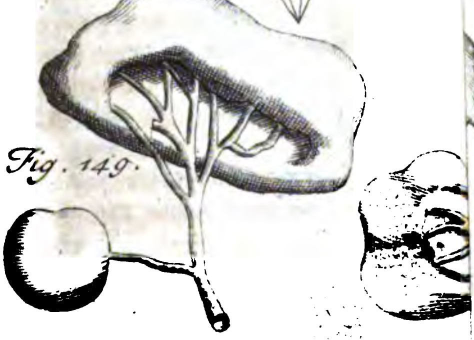


Fig. 149.



J. Harris Sculp.

Manner

Manner grow cold, and have little Senſation in them. But the moſt remarkable of all his Complaints, was, a new Progreſs the Stones had either found or made. Formerly at Night in Bed, they us'd to get up (as he expreſs'd it) to his Heart, and upon turning to his Knees, or ſtanding upright on his Feet, they would drop one by one ſo diſtinctly, that they might be counted, and in this State they always aroſe ſtraight up, on the right Side of his Breaſt; but now they riſe obliquely, and get under his right Arm, inclining towards the *Scapula*, and when they are in this Place, by giving him a Blow with the Fiſt on his right Shoulder, they will all fall down in a Lump together, and may very plainly be heard to claſh on the other Stones, which lie as they did formerly juſt above the *Os Pubis*. After he had told me this Story, I made the Experiment before Dr *Fowke* and Dr *Davies*, and the Matter of Fact proved true as he related it.

The Miſchiefs of ſwallowing *the* Stones *of* Fruit, *by Mr* H. Vaughan, *n.* 281. *p.* 1244.

VII. 1.] A Gentleman ſome Time ago eat above two Pounds of common Prunes, and ſome Time after about a Pound more: About a Fortnight before he died he had ſome Symptoms of the Stone. He had a violent Pain in the Neck of the *Veſica*, and about the *Urethra*, with Obſtructions in his Urine, &c. I ordered him a Terebinthinate Glyſter, which gave him Eaſe: His Pains afterwards increaſing, a Phyſician was ſent for, who preſcrib'd Glyſters, with Diuretics and Narcotics, to no Purpoſe. After his Death he was diſſected in the Preſence of Dr *Weſt*, and others. We found that the Prune-Stones had made a Perforation thro' the *Inteſtinum Rectum* into the *Pelvis*. We tied one Part of the Gut, and cut out a Piece, and emptied it: We took out 128 Prune-Stones in Number, beſides what we left behind in *Stercore*, in the other Part of the *Inteſtinum Rectum*. There was likewiſe a large *Polypus* taken out of the Left Ventricle of the Heart, &c.

A Plumb-Stone *in the* Guts *for* thirty *Years*, &c. *by Mr* J. Yonge. *n.* 282. *p.* 1279.

2.] *Sarah Swayn*, of a thin Habit, and middle Stature when but ſix Years old, was firſt afflicted with a violent Pain, together with a large hard Swelling on the left Side of her Belly, which laſted twelve Hours, and then went off without Uſe of any Remedy, or ſenſible Evacuation; and at the End of three Months returned, laſted, and went off as before.

Several Years it obſerved that Period, and then changed it's Intermiſſion from three Months to three Weeks, and ſo continued till ſhe was thirty-five Years old; in which Time ſhe married, and bore one Child, the Pain of which ſhe averr'd to be much leſs than what theſe *Paroxyſms* gave her.

During her Pregnancy, her Pains nor Intermiſſions had no Alteration, and in her whole Life ſhe found no Diet diſturb'd her but Milk and Salt Meats.

About nine Months before ſhe was cured, the Pain and Tumour increaſed to the Bigneſs of a Man's two Fiſts; ſhe endeavoured by many Remedies to get Eaſe, but in vain, till the Torment and Watching had ſo weakened her, that ſhe could not riſe out of her Bed.

In this Condition ſhe was adviſed by a Woman to take a Doſe of powder'd *Jalap*; it operated violently, and ſuddenly drove the Pain from her Side down to the *Anus*, where it reſembled a *Teneſmus*, *viz.* a conſtant and violent Inclination to Stools, without being able to force off any thing; and after ſhe had been thus crucified four Days, her Urine alſo ſtopt, and two Days after that, I was called in.

I perceived by their Report of the Matter, that ſomething obſtructed the Paſſage of her Excrements, and ſoon found it ſo by a Probe; I then anointed the Paſſage with *Populneum*, and taking hold of the Subſtance with a Pair of large Forceps, made to extract Stones from the Bladder after Lithotomy, I drew it forth.

Abundance of Wind and Excrements guſh'd out, and continued to flow till her Guts were emptied of all the Matter which had been ſo long retained; after which I ordered her an Anodyne Clyſter, and a compoſing Draught, and ever ſince (being ſeveral Years) ſhe continues well.

Fig. 151. The Thing extracted was round, ſomewhat oblong, having on it ſome ſuch Impreſſions as Mens Fingers make on Wax or Plaiſter. It then weighed ten Drachms, now ſcarce an Ounce; it was five Inches in Circumference; altho' it felt and otherwiſe appeared a Stone; it ſwam on Water, which made me ſee the Inſide of it, by cutting it in two with a Knife; externally it was black, and ſmooth as if varniſh'd, and no thicker; next to this thin Blackneſs was a Cruſt of Matter like Brick, the Thickneſs of an half Crown; within that appeared a Subſtance reſembling Paſte-Board, or chewed Paper, and within that lay a
Fig. 152. Prune or withered Plumb, with the Stone and Kernel cut aſunder by my Knife.

Thus all theſe wonderful Accidents, which ſo long moleſted this Woman, were occaſioned by this Plumb ſwallowed ſo many Years before; but how thoſe different Accretions were made to it in ſuch a Place as the Inteſtines? How it ceaſed to torment her at ſo many and ſuch different Intervals? Where it lurked between thoſe Fits, and how the Pain and Tumour obſerved ſuch exact Periods for ſo many Years; at firſt every three Months, and afterward every three Weeks? Are Queſtions I leave to others to reſolve.

Stones *from the* Gall-Bladder.

Many Authors (*a*) tell us of various Stones ejected by Stool, and of late many of them have been found to come out of the Gall-Bladder through the Choleric Channels of Jaundic'd People. I have ſeen two ſuch, bigger than any I have read of, one as big as a Pullet's Egg, which came from a Lady in the Operation of a ſtrong Cholagogue, taken for a Jaundice, that had reſiſted many other Remedies; the other

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(*a*) *Miſcell. Cur.* vol. 2. *obſ.* 89. 136. *Act. Med.* Barth. vol. 5. *obſ.* 65.

as big as a large Nutmeg, driven out by the ſame Means from an aged Man languiſhing in the ſame Diſtemper, and both of them for many Days after thoſe Stones came off, evacuated great Quantities of Choler by Stool, and were freed of the Diſeaſe.

That thoſe two Stones were generated in the *Folliculus Fellis*, or *Ductus Choledochus*, no Man will doubt, who conſiders the Conſequence, and knows that in Colour, Taſte, Weight, and Shape, they reſembled ſuch as are found in thoſe Parts upon Diſſection of Jaundic'd Bodies. I once ſaw near an Handful of them taken out of the Gall-Bladder of the *Portugal* Ambaſſador that died in *London*, 1679, and we are told by *Baglivi*, that *Malpigh*'s was full of them: They uſually are of a ſubcitrine Colour, reſemble bright Myrrh, and ſeem an Aggregate of ſmall Stones, which perhaps are made ſingly in the *Veſicula*, and coaleſce in the *Ductus*.

The Conſequence of their coming off, ſhews, that they cauſed the Jaundice in thoſe two Perſons I have mentioned, by obſtructing the Channels through which the Bile paſſes from the common Receptacle into the *Duodenum*. It may perhaps ſeem impoſſible to ſome Men, that Subſtances of that Magnitude could paſs through a *Meatus* ſo ſmall as the common *Ductus* is. But it hath been no Wonder to me this twenty Years, ſince I diſſected a Phyſician of this Place, who died of the Jaundice, and found the *Ductus Communis* large enough to admit my greateſt Finger, as three Phyſicians and one Surgeon beſides myſelf, ſaw.

Thoſe Stones which are generated in the Guts are of another Sort, and eaſily diſtinguiſhable from thoſe I am writing of. *Becker* ſpeaking of ſome Stones voided by Stool, ſaid——*Calculos illos in Inteſtinis genitos eſſe, quia colore, pondere, & figura à Choledochis lapillis diſtincti, arbitratus ſum.* Thoſe generated in the Gall cauſe the Jaundice, thoſe in the Guts, beget Cholical, Splanchnical, Hypochondriacal Pains, and ſometimes Nephritical, all which vaniſh when they are ejected.

I have ſeen Lumps of Stones as big as a Tennis-Ball, taken out of a Bullock's Guts. The Authors of the *German* Miſcellany (*b*) write of one very much bigger. *L. Riverius* (*c*) of a Man that continually with all his Stools voided Stones like thoſe generated in the Kidneys. *T. Bartholine* (*d*) mentions ſeveral, one particularly notable, being as big as a Pigeon's Egg, which was purged off from a Woman by a gentle Pill.——*In exteriore ſuperficie ſubcinereum, & dum à me clavo ferreo in duas æquales partes diffringitur, interius inſtar cryſtalli albicantem & rutilantem.*

There are many ſuch in the *Miſcell. Cur.* and which reſemble mine, *Vol.* 7. *Obſ.* 90. but there is one much more ſo, *Ambr. Pary*, *lib.* 25. *cap.* 19. but neither of them ſo ſtrange in Cauſe or Effects as mine.

Galen,

(*b*) *Vol.* 3. *obſ.* 110. (*c*) *Ad. Med. vol.* 1. *obſ.* 100. (*d*) *Vol.* 5. *obſ.* 65.

Galen, *Crato*, *Sennertus*, *M. Donatus*, *Z. Luſitanus*, *Fernelius*, *G. Horſtius*, *Schenckius*, have told the World of Stones generated in, and ejected from, the Inteſtines of diſeaſed People, but none that I know with ſuch ſurprizing Circumſtances as this.

Fig. 151, 152, 153.

Fig. 151. *The Ball.* Fig. 152. *It's Inſide.* Fig. 153. *The Plumb-Stone.*

Some Inſtances of the Miſchiefs *from* Plumb-ſtones *ſwallow'd; by Dr* Hans Sloane, ibid. *p.* 1283.

3.] A certain Perſon in *Lancaſhire*, having been for many Years ill of the Cholic, and receiving Relief from no Medicine, was diſſected after his Death. They took out of one of his Guts a large Ball ſix Inches about, of an Ounce and half Weight, made up of a ſpungy Matter which ſwims in Water, and viewed by a Microſcope, appeared to be made up of very ſmall, tranſparent Hairs or Fibres, wrought together, after the Manner of the *Tophus Bovinus*, taken out of the Maws of Oxen. In the Middle or Center of it was a common *Prune* or *Plumb-Stone*, which had been ſwallowed, and ſticking ſomewhere in the Guts, and gathered that Subſtance about it which reſembled the ſmall Hairs on the Skins of ſeveral Creatures or Fibres of Plants we eat. Dr *Charles Leigh*, in his Natural Hiſtory of *Lancaſhire*, &c. in his firſt Table has figured this *Fig.* 4. He ſhewing me the ſame, I was deſirous to ſee what it was made of, and had it cut for that Purpoſe, and found it of a hairy or fibrous Subſtance, Layer upon Layer, or Coat upon Coat, over a Plumb-ſtone. This Ball with it's Plumb-Stone, Dr *Leigh* gave me, and it is now in my Poſſeſſion, and ſeems to be of the ſame Subſtance with that mentioned by Mr *Yonge*.

Dr *Cole* ſhew'd me a Letter he had from the Country, and ſome ſmaller Balls than the two before-mentioned, which had in their Centers Plumb-ſtones. The Perſon he was conſulted for, had, I think, the Cholic to a great Degree, and had voided ſeveral of them, they were not ſo ſpherical, but of a compreſs'd Figure, ſmooth on the Outſide, and glaz'd as ſome of the *Tophi Bovini* are; and ſeemed within of the ſame Subſtance with the former *ſtratum ſuper ſtratum* upon a Plumb-ſtone.

Dr *William Stokeham* ſhewed me a Ball about the Largeneſs of that I had of Dr *Leigh*, which had been voided by a Perſon after great Sickneſs, and preſerved by the Patient's Phyſician, Dr *George Thompſon*, who has wrote a large Account of this Caſe in his *experimenta admiranda*, p. 67. *de Lithocolo*. I had this laſt Ball in my Poſſeſſion ſome Time, and in Appearance it was of the ſame Subſtance, but what was contained in it I could not tell, not being permitted to open it; but that Author tells us it had ſeveral Plumb and Cherry-ſtones in it. Theſe Balls ſeem'd to be form'd ſomething after the Manner of *Bezoars*, which generally have ſome Seed for their Center or *Nucleus*, on which Coats of another Subſtance are gathered.

Theſe Inſtances are ſufficient to ſhew the Folly of that common Opinion, that the Stones of Fruit are wholſome; for tho' by Nature the Guts are ſo defended by the *Mucus Inteſtinalis*, that very ſeldom

People ſuffer; yet if we conſider the various Circumvolutions of the Guts, their Valves and Cells; and at the ſame Time conſider the Hair of the Skins of the Animals we feed on, the Wool or Down on Herbs and Fruit, the Fibres, Veſſels, and Nerves of Plants, which are not alter'd by the Stomach, the ſame Caſe may very eaſily happen. I once ſaw as ſtrange a Diſtemper, and almoſt as obſtinate and long as I ever met with, proceed from a great Quantity of *Strawberry-Seeds*, which had lodg'd in the Guts, and after their Diſcharge the Perſon was eaſed. And I have heard of many (beſides thoſe publiſh'd) who have loſt their Lives by ſwallowing many *Cherry-Stones*.

4.] I intended to have given an Account of a Ball lately voided by Madam *C——ly*, after ſuch ſevere Pains that her Life was in Danger; but ſhe is not willing to have it cut, and the Bulk of it is much ſhort of another Caſe that I know of; but this may ſerve as a further Inſtance of the Danger of ſwallowing the Stones of Fruit; for immediately after ſhe voided ſeveral *Plumb-ſtones*, tho' ſhe had not of twelve Months before eaten any of that Fruit.

—on the ſame; by Mr R. Thoreſby, *n.* 304. *p.* 2164.

Captain *Weſt* told me he had once ſeen two Stones voided by a Neighbour, larger than any of thoſe three formerly mentioned; he has ſince procur'd them for me, and the leſſer of them is ſomewhat larger than the biggeſt of the other, but the other is ſurprizingly great; the Form of it is not much unlike the *Echinus* Shell, or *Helmet-ſtone*, flat on one Side, and roundiſh on the other; 'tis above ſix Inches one Way, and ſeven the other, in Circumference. Mr *Hodgkinſon* ſent this Relation along with them, 'That they were taken 'from *William Coldell* of *Green*, *May* the 10th, 1693. They weighed 'nine Ounces when firſt evacuated, and were remov'd by a Diet-'Drink with an Alcali Powder, and a Magiſterial Stomach-Plaiſter; 'that the Perſon died ſeven Years after, of one too large to be eva-'cuated: for upon the griping of it betwixt the Hypochondrium and 'Share-Bone, it felt to be as large as a Gooſe-Egg.'

5.] One *Crumbleholm* came to me ſome Time ago, and complain'd of a great Loſs of Appetite, with Scorbutic Itch, and ever and anon ſevere Convulſive Cholics below his Navel, all along the *Hypogaſtrium*. They laſt not above a Quarter of an Hour, but often return, and raiſe Tumours the Bigneſs of a large Walnut, which diſappear, and remove as the Pain ſhifts. He has been troubled with it ſome Years, and took Phyſick of almoſt every one he met with; but, as far as I can perceive, not in any regular Method. I began with mild Emollient and Carminative Glyſters; purged with *Decoct. Sen. Gereon. Syr.* *e Spin. cervin.* & *Tinct. Sacr.* In the Intervals of the Purges, I gave *Æthiops Mineral*, with bitter Decoctions Alterative, made more Carminative with *Rad. Zedoar.* and *Caſtor.* He was relieved for that Time; his Appetite and Complexion mended, but preſently was as as ever. Then he ſhew'd me the Stones voided by Stool, upon a ght Mercurial Purge, which he took laſt *Eaſter*. Upon opening one

— Another Caſe, &c. by Dr Holbrooke, *n.* 325. *p.* 28.

of them, I found he had ſwallowed either ſome Plumb or Apricot Stones, which by their Stay in the Inteſtines, were incloſ'd in the Excrements, as I take it; and, by the Purge being diſlodged from their *Sinus*, ſent forth. Hoping then that by ſtronger Evacuations, if I could remove any other that might remain, it might tend to his Cure, I order'd ſtronger Medicines. However, I could not get any more from him; and he being out of Hopes, and uneaſy to be kept any longer from his Buſineſs, has left off taking any thing. Laſt Week I ſaw him, and found him much in the ſame Condition, tho' ſomewhat weaker, and ſunk more in his Fleſh.

—— on the ſame, by Dr W. Cole. Ibid. p. 30.

I look upon theſe Stones of *Crumbleholm*'s to be not formed of *adhering Excrements*, as Dr *Holbrooke* ſeems to ſuppoſe, but to be made thus:

When the Plumb-ſtones happen to be included in a fit Glandulous Receptacle, I conceive they may come to be thus coated over by the viſcous Liquor ſecreted out of the Secretory Ducts of thoſe Glandules, which by long lying there may come to acquire ſo great a Bulk, by the continual Appulſe of the ſame Liquor.

This Receptacle I gueſs to be the *Inteſtinum cæcum*, which, though ſmall naturally, may be, as other Membranous and Glandulous Parts are, capable of a conſiderable Extenſion: So that, when by Reaſon of the *Periſtaltic* Motion of the *Inteſtines* above, one of the Plumb-ſtones may happen to be, by it's pointed Extremity, intruded; the whole may, by the ſame repeated, though ſlow Motion, dilate the Cavity ſo, that the whole Body of the Stone may by the ſame Method be ſtill farther and farther protruded, till it come to the further Extremity; which being cloſed, muſt be preſumed to detain it there, ſince 'tis hard to conceive it can quickly get out again, that *Periſtaltic* Motion being always forward. One of theſe Stones being thus enter'd, 'tis eaſy to conceive more may be admitted, ſince the firſt cannot but dilate the Paſſage for another that follows, and ſo on till the Cavity be full: Whilſt theſe Stones lie there, they muſt be conceived to offend the Part, as having extended it beyond it's Natural State: So that the Secretory Ducts of the Gland, of which the inner Coat of that, as well as the reſt of the Inteſtines, is conſtituted, muſt be proportionally dilated; whereby an eaſier Way is made for the Liquor, they ſeparate, to be excreted. This being of a viſcid and concreſcible Nature, muſt, ſince it cannot get forth, be preſum'd to adhere to the *Subſtratum*, the Stones, and ſo by Degrees incruſt them; which Cruſt, by the long Confinement, muſt grow ſo much thicker, for the ſame Reaſon as it began, the Ducts being kept conſtantly open, and the Cavity more and more dilated, the greater the Incruſtation is. So that I conceive the Symptoms are eaſily accountable for, from the Offence given to the Part, which being ſenſible, as all membranous and fibrous Parts are, the Pain muſt grow greater, the greater the Extenſion is; and the Change of the Poſture of the Tumour may very well be conceived to proceed from the different Poſtures the Inteſtines put on, by the Chyle or Excrements paſſing along them, and ſometimes filling one Part, ſometimes another, as they are protruded further and further, their Lubricity on the Surface, Length, and Confinement obviouſly favouring that *Phænomenon*. I am of Opinion, the true *Bezoar Stones* are form'd in the Beaſts, that yield them, in the ſame Manner; but whether their Stomachs or Inteſtines have other Cavities capable of receiving and retaining them to their full Growth, is to be determined by Anatomy. This, I think, is certain, that all of them have either a Straw, Stick, or other Subſtance different from the exterior Matter, which we call the Stone, in the Middle of them; and thence I conclude the Manner of their Formation to be the ſame. From the Continuance of his Symptoms, I believe there may be more behind; and cannot think any other Method more likely to extrude them, than by having his *Abdomen* well anointed with ſome emollient Oils or Liniments, and very well agitated backward and forward, as much and as long as he can bear, and this both Morning and Evening: After a little while, that the Stones may be preſumed by this Agitation to be ſomewhat diſlodged, ſome gentle Purgative, I conceive, may be of uſe to be now and then given to carry them downwards, and with all emollient Glyſters to ſollicit it gently, *&c.*

Miſchiefs from ſwallowing *the* Stones *of* Bullace *and* Sloes, *by Mr* W. Derham, *n.* 349. *p.*484.

VII. The *Larger* Stones of *Prunes* and *Plumbs* ſwallow'd, have frequently, I know, produc'd very fatal Effects; the leſſer Stones of *Sloes*, *Cherries*, &c. having not been thought ſo dangerous (many ſwallowing them on a Notion that they are uſeful in preventing a Surfeit from the Fruit) I ſhall give an Inſtance of the ill Conſequences of theſe *Leſſer* Stones.

About two Years ago, the Servant of a neighbouring Clergyman complained to me of exceſſive Pains in and about his Stomach; that he never lay under any Dejection of Appetite; but that whenever he did eat he could not retain it, but in a little Time vomited it up. By which Means he was, in a ſhort Time, reduc'd to a very low and languiſhing Condition, inſomuch, that they began to deſpair of his Life.

Upon this he applied himſelf to ſome Practitioners in Phyſic, one of which ply'd him with ſtrong Vomits eight Days together, with very little Signs of Succeſs. But ſome Time after, having Occaſion to ride ſomewhat more than ordinary, he found himſelf very ſore in his Stomach, and ſick; which ending in violent Vomiting and Straining, brought up the firſt Stones he ever perceived to come from him, which were about twenty in Number.

After this he had frequent Returns of the vomiting up of *Bullace* and *Sloe-Stones*, eſpecially upon ſtrong Exerciſes; particularly moving and ſtooping much; in riding alſo, tho' gently: Upon theſe Occaſions he would be ſeized with acute Pains in his Stomach, and ſoon after vomit up more of thoſe Stones.

He hath counted above one hundred and twenty *Bullace* and *Sloe-Stones* that have been diſcharged; and many others he could not number, by reaſon they came up when he was in Riding, or in his Buſineſs. He is not yet free of them, but is in Pain oftentimes, and vomits them up, eſpecially in riding; but after he hath diſcharged them, he is much eaſier for a while. He commonly brings up a ſlimy Matter with them, mixed with Blood, or ſomething very like Blood.

The Cauſe of all this Diſaſter the Man aſſures himſelf was this, namely, being in his Youth a great Lover of Fruit, he uſed greedily to devour all Sorts he could come at, and *Bullace* and *Sloes* being the eaſieſt to be gotten, he uſed to ingurgitate great Quantities of them, without evacuating many of the Stones by Stool, as he well remembers, and as he obſerved others did. Theſe Stones he thinks have lain in his Stomach (ſome of them at leaſt) above ten Years; but he felt no Pains till about four Years ago. And thoſe at firſt were not ſo violent, nor attended with ſuch ſevere Fits of Vomiting and Loſs of Appetite, as they by Degrees came to be afterwards.

An unuſual Cholic, *by Dr* Davies, *n.* 275. *p.* 965.

VIII. Laſt *May*, Dr *Shaw* of *Tamworth*, deſired my Aſſiſtance in the following Caſe. A Perſon, aged between fifty and ſixty, had been for three or four Years laſt paſt troubled with Gripes, which generally return'd once a Month, or thereabouts; his Body for the moſt Part coſtive, and therefore was forced to ſpur Nature with *Daffey*'s Elixir or Aloes; ſometimes the ſmoaking a Pipe of Tobacco ſupply'd the Uſe of theſe Medicines. Laſt *April* coming from *London*, heated himſelf very much with his Journey, having walked a good Part of the Way, and as ſoon as he came Home, had a Return of his Cholic Pains, which continued upon him for eighteen Days, notwithſtanding the Methods commonly uſed in that Caſe, during which Time he had no Stool, beſides what the firſt and ſecond Clyſters brought away; his Complaint upon his Seizure, was of a Pain in his right Side, in the *Regio Iliaca*. Some Time before he died, his Belly ſwelled much, and was as tenſe as any Drum; he vomited for two or three Days at the Beginning, which left him, and returned not till juſt before he died, which was at the Expiration of the 18th Day, at which Time he brought up two or three Mouthfuls of black Choler; but never, during his whole Illneſs, vomited any Excrement. Dr *Shaw* prevail'd to have an haſty Inſpection of his *Abdomen*; he found ſome black Choler in the Stomach, the *Duodenum* and the reſt of the *Inteſtina tenuia* void of Excrement, but incredibly diſtemper'd with Wind, and tracing the Canalis of the Guts as far as the *Cæcum*, found that of a blackiſh Colour; and from thence, for about a Yard in Length, the Colon mortified, and ſo rotten, that the Excrements had made their Way thro it at ſeveral Places, into the Cavity of the *Abdomen*; about two Inches of the mortified Gut was faſten'd to the *Peritonæum* on the right Side. This Part of the Colon was ſo extended with Excrements of a ſoft Conſiſtence, that they, when taken out, filled two Chamber-pots; at the Extremity of the Mortification, towards the *Rectum*, the Obſtruction which occaſioned all theſe Misfortunes, offered itſelf to View very plainly; for about ten Inches of the Colon was doubled, as if you had taken a Piece of Tape, and folded it; the two contiguous Surfaces of the Duplicature adhered ſo firmly together, that you could not ſeparate them without tearing the exterior Coat of the Inteſtine. Upon ſeparating this Coaleſcence, there fell from that Part a whitiſh Mucus, the Adheſion was about three Inches broad; the middle of the Duplicature which made the acute Angle, and where the Excrements ſtopped, was ſmaller, and the Membranes thinner than in any other Part of the Gut; from thence towards the *Rectum*, the Colon was ſound, and void of Excrements, occaſioned by the frequent Uſe of Clyſters.

Of a Child, with the Inteſtines, &c. *in the* Thorax; *by Sir* Ch. Holt, *n.* 275. *p.* 992. *Fig.* 154.

IX. I was lately preſent at the Opening of a Child, which dy'd about two Months old; they gave the following Account of the Child's Sickneſs: That

'The Child was uneaſy and reſtleſs from it's Birth, and conſtantly
'laboured under a Difficulty of Breathing.

'That it's Illneſs was like nothing they had ſeen in other Children;
'neither could they perceive it reliev'd by any thing adminiſtred to it,
'tho' by the Advice of a learned Phyſician; but it lay groaning and
'pining till it died.

'That they had always obſerv'd, when the Child was undreſs'd,
'an odd ſort of working in it's Breaſt; and could perceive a Crawling
'round the Ribs and Breaſt on both Sides, as if a Knot of ſmall
'Eels, or large Earth-worms had been pent up within the Cavity.'

When we had open'd the *Abdomen*, there appear'd none of the *Viſcera* belonging to the Belly, except the Liver, the Kidneys, *Veſica Urinaria*, and *Inteſtinum Rectum*. We at firſt imagin'd that the other Inteſtines might be cover'd by the Liver, which (tho' it be commonly large in Children) in this exceeded the uſual Size; but upon turning of it up towards the *Diaphragm*, we only found under it's concave Part, the Stomach, not lying in it's natural Poſture, for the *Pylorus* was drawn by the *Duodenum* croſs the *Vertebræ* of the Back towards the *Fundus Ventriculi*, and part of the *Duodenum* paſs'd through a Foramen in the *Diaphragm*, plac'd on the left Side of that through which the *Gula* deſcends, which occaſioned the *Pylorus* to lie almoſt *ſub fundo Ventriculi*. We then reſolv'd to trace the *Rectum* from the *Anus* upward, not doubting but that it would lead us to the *Meſentery* and *Inteſtines*. The *Rectum* lay in an oblique Line from the *Anus* to this new *Foramen*, and was receiv'd into it with a Portion of the *Duodenum*. This *Foramen* ſeem'd to be form'd by Nature, *à primo Ortu*;

for tranſmitting thoſe Guts into the *Thorax*; for had it been made by any Force, it's Sides would have appear'd wounded, or lacerated; but, on the contrary, round this Orifice there was a ſmooth Verge, as is ſeen in *Foramine Venæ Cavæ pervio*, or that, *per quod Gula deſcendit.*

When we took off the *Sternum*, we ſaw the *Meſentery cum adjunctis Inteſtinis* in the Cavity of the *Thorax*, and lying upon the Heart and Lungs. There was no *Omentum* ſpread over the *Inteſtines*; that, as I remember, was wholly miſſing, as was likewiſe the *Mediaſtinum.* Moſt Part of the *Duodenum* lay in the *Thorax*, and all the reſt of the Guts, except the *Rectum*, which aſcended in an oblique Line from the *Anus*, and it's upper End was inſerted into this Orifice. We then began to conſider how this Child, according to the common Notions of Nutrition, could be nouriſhed? That it was nouriſhed ſeems plain, becauſe it daily receiv'd Food, and regularly voided Excrement, as we were aſſured by thoſe who attended upon it. So we propos'd to enquire what Communication there was between that Gland or Glands, in the middle of the Meſentery (commonly called *Pancreas Aſellii*) and the *Receptaculum Chyli* placed between the internal lumbar Muſcles, called *Pſoas*; but upon the moſt accurate Search we were capable of making, there was none to be found; for the whole Meſeraick Membrane, and Inteſtines, lay perfectly looſe upon the Heart and Lungs, abſolutely diſengaged from any Manner of Communication with any other Part.

That Vermicular Motion, which ſhewed itſelf on the Ribs and Breaſt, we aſcribed to the Periſtaltic Motion of the Guts; and the *Dyſpnœa*, we thought, might be occaſioned by the Preſſure made on the Lungs by the Inteſtines and Meſentery, which likewiſe ſo filled the *Thorax*, that there wanted Room for the Lobes of the Lungs to move freely in, and by Conſequence Inſpiration and Expiration would be performed with Difficulty. *In the* Figure; *a, Shews the* Foramen *thro'*
Fig. 154. *which in the* Figure *the* Vena Cava *paſſes. b, The* Foramen *thro' which the* Gula *deſcends. c, The* Foramen *thro' which Part of the* Rectum *and* Duodenum *went into the* Thorax.

An extraordinary Effect *of the* Cholick, *by Mr* St Andre, *n.* 351. *p.* 580.

X. The *Periſtaltic* Motion of the Inteſtines is by all Anatomiſts ſuppoſed to be the proper Motion of thoſe Cylindrical Tubes.

The uſe of this Motion is to propel the Chyle into the *Vaſa lactea*, and to accelerate the groſſer Parts of the Aliment downwards, in order to expel them, when all their nutritive Contents are extracted.

This Motion thus eſtabliſhed, it naturally ſeems to follow, that an Inverſion of it (call'd for that Reaſon an *Antiperiſtaltic* Motion) ſhould force the *Aliments*, *Bile*, *Pancreatic Juice*, and laſtly the *Fæces* to aſcend towards the Mouth.

The Cauſe of this *Antivermicular* Motion, is aſſigned to a Stoppage of the Inteſtine, or to a great Length of it, being engaged in the ſame Manner as the Fingers of a Glove are choak'd by inverting the Glove in drawing it off.

This ſuppoſed, the *Antiperiſtaltic Hypotheſis* ſeems at firſt Sight very natural, and anſwers moſt Difficulties. For if the *Vermicular* Motion accelerates the Contents of the Inteſtines downwards; the *Antivermicular* ſhould force them upwards towards the Mouth.

Was this Suppoſition as certain as 'tis generally received, I ſhould not preſume to advance that there is no ſuch thing as an *Antiperiſtaltic* Motion of the Inteſtines; and that the *Meſerere mei* is as often a violent Contraction of the Abdominal Muſcles, as a Stoppage or Inverſion of the Inteſtines.

So laying aſide all Prevention, let it be granted that this Contraction of the Abdominal Muſcles is cauſ'd by the Redundancy of the Inteſtines or their Contents: Then comparing the Symptoms of this Diſeaſe, with thoſe of the different Kinds of *Hernia's*, we ſhall find by the Analogy of the Parts, Reaſon and repeated Experience, that the *Chordapſus*, ſo call'd by *Celſus*, is a Diſeaſe in which the *Inteſtines* and *Omentum*; at other Times, the *Pancreas* or *Spleen*; nay, even the *Meſentery* itſelf, are ſometimes forced thro' the *Diaphragm* into the *Thorax*.

All theſe tender Parts being ſtrongly compreſs'd by the continual Motion of this Muſcle, muſt by Conſequence cauſe the ſame Accidents as in the *Bubonocele* or compleat *Hernia*, there being no Difference in theſe two Caſes; but that the firſt is a ſtrangling of the *Inteſtine* by the *Diaphragm*, and the latter a choaking of the *Inteſtines* by the *Abdominal Muſcles*.

One Example of the many of the like Nature, that I can produce, will much confirm this Aſſertion.

A Gentleman that came to Town in good Health, meeting with ſome Friends, drank a great deal of new-bottled Oat-Ale, after ſome Pints of Wine. Theſe Liquors fermented ſo violently in his Stomach and Inteſtines, that he was taken with a violent *Cholic* the ſame Night.

In the Morning an Apothecary was ſent for, who adminiſtred a Clyſter, and took ſome Ounces of Blood to relieve the Patient, who complain'd of a great Pain in his left Side.

The Clyſters being repeated the Night following, as alſo the next Morning, and the Patient growing worſe, the Apothecary gave him a violent Vomit; which operated eight or nine Times: This added Fuel to the Fire; and the Patient having from that Time been in a deſperate Condition, two eminent Phyſicians were called, who order'd that the Clyſters ſhould be repeated: But they not prevailing, I was ſent for about ſix Hours before the Patient died: I found him complaining of a violent Pain in all the Region of the *Abdomen*; a frequent Inclination to vomit; labouring with a great Difficulty of

Breathing, together with a very ſlow Pulſe; his Belly being very hard, though not ſwell'd.

This laſt Indication made me conclude, that the Diſeaſe was a violent Contraction of the Abdominal Muſcles, which had overcome the *Diaphragm*, and that probably the *Inteſtines* might be forc'd into the *Thorax*.

I was the more confirm'd in this Opinion from Examples of the like Caſe; upon which I order'd a Fomentation of hot Milk, adding to every Quart a Drachm of *Liquid Laudanum*, which, in theſe Maladies gives great Relief: But, before it could be got ready, the Patient expir'd in a violent Convulſion.

In opening this Body, I found the Abdominal Muſcles ſo much contracted, that it was almoſt impoſſible to penetrate them with a ſharp Scalpel.

Upon Examination, I found the Stomach empty, and ſome Parts of the *Duodenum*, but the *Jejunum* and *Ilium* ſo much diſtended with the fermented Oat-Ale, that the *Ilium* had four Inches in Diameter, and the *Colon* above eight.

The *Ilium* was alſo pretty much inflamed in it's inferior Part; and all the Valves of the *Colon* were obliterated, by the great Diſtention of that *Inteſtine*.

But the greateſt Diſaſter was, the Dilatation made in the *Diaphragm*, as I ſuppos'd; juſt upon the Chink which remits the intercoſtal Nerve to the *Viſcera* of the *Abdomen*, thro' which a Portion of the *Colon* was forc'd, and the greateſt Part of the *Omentum* and *Pancreas*.

Theſe tender Parts being choak'd, ſoon inflamed, a Mortification of them following; and a Rupture of the *Pancreatick Vein* caus'd an internal *Hæmorrhage*, which fill'd all the left Cavity of the *Thorax*, inſomuch that the whole left Lobe of the Lungs was compreſſed almoſt under the *Muſculus Scalenus*.

The Quantity of extravaſated Blood was very great, and it was not in the leaſt coagulated.

I ſhould have been more particular in proving the Impoſſibility of the *Antiperiſtaltic* Motion, if Dr *Haguenot* had not prevented me by his *Memoir*.

This Gentleman is not far from Truth, and what he ſays is certain: But I am ſurprized that the like Caſe has not occurr'd in his Practice.

The diſeaſed Parts were produc'd before the Royal Society.

A Diſſection *of a Perſon that died of the* Iliac Paſſion; *by Mr* H. Vaughan, *n.* 281. *p.* 1245.

XI. I lately attended a Youth (14 Years of Age, of a ſanguine Conſtitution) for about 30 Hours in the *Iliaca Paſſio*, very terrible for the Time. About 3 or 4 Hours before he died, I adminiſtred a *Terebinthinate* Clyſter, which gave, during it's Stay, immediate Eaſe; he continu'd ſo for about an Hour, but then his Diſeaſe return'd again as ſevere as ever; ſome time before he died he voided ſome of his Clyſter by Vomit.

After Death he was diſſected, I found the *Liver* only ſomething larger than ordinary, the *Ventricle* was conſiderably extended; in the *Jejunum* the Excrements had made a Breach, and ſome Quantity was evacuated; a conſiderable Part of the *Ilium* was very livid, but not in the leaſt diſtended; the *Colon* was much like a contus'd Wound about three or four Days old; in the Centre of it, I found it ſomething freſher, not ſo livid as the Outſide: About the Beginning of the *Rectum* there was another large Ruption, and more Excrements voided.

I diſſected lately a Child which had an Involution of the Inteſtines, which the Vulgar calls the Twiſting of the Guts.

The Inteſtines *grown* Cartilaginous; *by* A. Meſaporitus, *n.* 303. *p.* 2119.

XII. A Country Man, who had been a long Time emaciated, troubled with Cholicks and Spaſmodick Contractions in the Hypochondria, and evacuated almoſt nothing by Stool, being quite worn out with continual Pain, at laſt died. Upon opening his Body, we found the *large Inteſtines*, eſpecially towards the Flexure of the *Duodenum*, ſo firmly connected with one another, and with thoſe that lay next to them, by Means of callous Protuberancies, that it was difficult to ſeparate one from another, and, which was worſe, their Subſtance was grown into a hard Cartilage, and ſo thickened, that ſcarce any Cavity remained.

Of an Extraordinary Coſtive *Perſon; by Mr* B. Sherman, *n.* 302. *p.* 2111.

XIII. 1. *Thomas Philips* of *Eaſtthorp* in *Eſſex*, was well in every reſpect till he was a Year and a Quarter old; at which Time a very ſtrange and almoſt continual rumbling in his Inteſtines ſeiz'd him; the Conſequence was a violent Looſeneſs, for which all the Phyſicians in the Place could find no Remedy: But at laſt when they deſpair'd of the Child's Life, the Looſeneſs terminated in ſuch an unuſual Obſtruction, that he did not go to Stool for a Fortnight or three Weeks together; and from three Weeks together it proceeded gradually to the Intervals of ſeventeen or eighteen Weeks, and ſo continued till he came to be about the Age of Fifteen, when it's Body reſum'd it's natural Temper, which laſted four or five Years; but then the Obſtruction return'd and continued, or rather increas'd till he died; for it was cuſtomary with him in the laſt Years of his Life not to evacuate any manner of Excrement under the Interval of nineteen or twenty Weeks; nd ſometimes (twice at leaſt) he had no Diſcharge for one or two and wenty Weeks together. He liv'd to be near twenty-three Years of Age, and walk'd about almoſt to the Hour of his Death. He was ſuddenly ſeized with very ſick Fits (but could not vomit); two or three of which Fits carried him off in a few Hours; and when he died, it was nine Weeks after he had any Stool. I aſked him whether he did vomit often, or had at any Time any excrementitious Taſtes in his Mouth, or did ſweat much, or made more Urine than in Proportion to his drinking, or whether he found any Eaſe when he did either vomit, ſweat, or urined; all which Queſtions were anſwer'd in the Negative. When he did go to Stool, he evacuated very many times in a Day, and ſeveral Days together, until he had emptied himſelf. But his Mother aſſures me, that throughout his whole Life he never diſcharg'd any other than very thin Excrement.

Before his Time of Evacuation came about, he was of an extraordinary Bigneſs many Weeks before his going to Stool, unleſs when he could break Wind, which he often endeavour'd to do, by laying his Body on the Edge of a Table or Stool; but could not often by ſo doing produce the deſired Effect. He declin'd the Uſe of all Medicines for many Years before he died, contenting himſelf with going to Stool once in three or four months, or nineteen or twenty Weeks. But what is moſt remarkable, is, that he generally had a pretty good Stomach, and eat and drank as the reſt of the Family did; nay, till the Time that his Body came to be very full, he could do the Work of a Man at Plow, or ſuch like huſbandry Labour.

His Mother would by no means permit me to open him: But the Story is certainly true, for I had it from the Perſon's own Mouth in his Life-time, and confirm'd at the ſame time by his Mother, who is yet living; many Gentlemen too had the Curioſity to ſee and examine the Perſon.

A Remark *on this Caſe, by Mr* W. Cowper. *Ibid.*

2.] It is not improbable, if the *Abdomen* of this Perſon had been opened, but ſome of it's Contents would have been found not unlike thoſe I have mentioned, in my Explication of the 34th *Table* of Prints publiſhed by Dr *Bidloo*; where I take Notice of a young *Gentlewoman* I diſſected, in whom I obſerved the *Omentum* ſo leſſened, that at firſt it appeared doubtful if that Part had ever been exiſtent in that Subject; but, on ſtrict Examination, the little Remains of it reſembled a *Congeries* of ſmall *Glandules*, ſtuffed with a *Suet*-like Matter. The whole Canal of the *Inteſtines*, even from the *Pylorus* to the *Anus*, was diſtended with *Excrements*, and the *Surfaces* of all the ſmall *Guts* adhered ſo ſtrictly to each other, that they could not be parted without tearing their external *Membrane*, to which the *Omentum* contributed by it's Adheſion: The whole *Compages* of the *Inteſtines* very much reſembling that of the external Surface of the *Brain* covered with the *Pia mater*, ſo that the *Meſentery* in that Subject could not be ſeen till this external Incloſure was divided. By this Diſorder, 'tis certain, the *Periſtaltic* Motion of the *Guts* muſt needs be very much leſſened, if not quite hindred. The *Peritonæum* alſo in that Caſe was very much thickened, and had ſeveral preternatural white Bodies ſet at various Diſtances on it's internal Surface; the like appeared on the *Stomach*, which very much reſembled in Figure the *Miliary Glands* on the back Part of the *Aſpera Arteria.*

A Diſſection *of a Child* Emaciated, *by Dr* P. Blair. *n.* 253. *p.* 631.

XIV. This Child was five Months old, and was ſo emaciated, that he appeared rather to have decreaſed, than to have increaſed in Bulk, from the Time of his Birth, his whole Body not weighing above five Pounds. The Skin and Muſcles of the *Abdomen* were very thin, but the *Peritonæum* was preternaturally thick. The *Ventriculus* was more like to an Inteſtine than to a Stomach, it's Length being five Inches, and it's Breadth but one Inch. The Coats of it were thick and fleſhy, and the Cavity very inconſiderable. The *Pylorus*, and almoſt half of the *Duodenum* were cartilaginous, and ſomething inclined to an Oſſification, ſo that no Nouriſhment could have paſſed into the Inteſtines, tho' the Stomach had been capable of containing it, which makes it no Wonder that the Body was ſo emaciated. There were ſcarce any Foot-ſteps of the *Omentum* to be ſeen, even at the Bottom of the Stomach, to which it uſually adheres.

The right Lobe of the *Lungs* adhered firmly to the Ribs, and had three Exulcerations, which contain'd purulent Matter. It was ſo very thin and compact, that it ſeem'd as if that Lobe had never been of Uſe in Reſpiration. The left Lobe was of a more florid Red, ſpongy, and free from any Adheſion.

Upon enquiring after the Symptoms this Child had been affected with, his Mother told me, he ſeem'd to be healthy till he was about a Month old, when he was ſeiz'd with a violent *Vomiting*, and a Stoppage of Urine and Stool. Some Time after, both theſe became more regular, but the *Vomiting* ſtill continued. He ſeem'd to have a great Appetite, taking what Suck, Drink, or other Food was offer'd him, with a kind of Eagerneſs; but he immediately threw it all up again. He had all along breathed freely, and had no Cough, notwithſtanding the Exulcerations above-mentioned. This confirm'd me in the Opinion, that he had never breath'd by the right Lobe of the Lungs.

There could be nothing more emaciated than this Child was; and it ſeems to be worth conſidering, whether his Illneſs might not be owing in a great Meaſure to the Want of the *Omentum*, (for he ſeemed never to have had any); as alſo, whence it is that this Part is generally conſum'd in an Atrophy, and in moſt Hydropical Caſes, except where itſelf is more eſpecially concern'd.

A Piece *of the* Gut *of a* Dog cut *out, and* cur'd, *by Mr* J. Shipton. *n.* 283. *p.* 1299.

XV. That Wounds of the *large Inteſtines* are frequently mortal, and thoſe of the *ſmall* ones always kill the Patient, has in all Ages been univerſally received as a Truth.

Hippocrates, Lib. 6. Aph. 18, 24. pronounces a bitter Sentence upon them; as alſo *Celſus*, Lib. 5. cap. 26. Lib. 7. cap. 16. And *Fabritius ab Aquapendente* (Operat. Chir. cap. 55.) confirms the ſame Sentence from his own Experience.

I know very well that *Paul Barbette* affirms that a Wound of one of the ſmall Inteſtines has been cured; which he likewiſe ſays *he can* *prove by a remarkable Example, Chirurg. Part 2. lib. 2. cap. 11.* I wiſh he had left the Hiſtory of ſuch a remarkable Caſe to Poſterity, that ſo, having all the Circumſtances of it before our Eyes, we might be able to form a more certain Judgment about it. It is ſurpriſing beſides, that amongſt ſo many famous Men who practiſed Surgery in the ſame Country with him, and favoured the Publick with a great many Obſervations, there ſhould none of them tranſmit ſuch a remarkable Cure to Poſterity. But I ſhall neither contradict the Truth of his Aſſertion, nor vindicate it againſt the Experience of the reſt of the World.

But though Wounds in the Inteſtines of Men are acknowledged by all the World to be extremely dangerous, yet that the Cure of them in Dogs is far leſs troubleſome, and attended with leſs Danger, will appear from the following Experiment, which I made *November* 20, 1702, in the Preſence of Mr *William Plakille*, Maſter of the Society of Surgeons in *London*.

Having tied a Dog in the uſual Manner; we made a large Wound into his Belly, took out a Part of the *Inteſtinum Ileum* that firſt appeared, tied the *Meſeriack* Veſſels which run upon it, cut the Inteſtines acroſs in two Places with a Pair of Sciſſars, took about two Inches of it quite away, ſewed up the Wound of the Inteſtine with the Glover's Stitch, and that of the Abdomen with the interrupted Suture, covered it over with Plaiſter, and then let him go looſe. At firſt he tottered as if he was giddy, and ſeemed to be very weak; and that ſame Night he vomited twice: A few days afterwards, the Sutures becoming a little looſe, we tied them a little tighter, by putting in little Pegs, and twiſting the Threads upon them. And, in three Weeks after, laying aſide the Dreſſings and Bandage, he cicatriſed it himſelf by licking it.

I muſt not neglect to mention the Retraction of the Inteſtine as ſoon as it was cut through, when ſhrinking on each Side, and ſhutting itſelf up, it exactly reſembled a Sphincter.

After ſome Weeks, during which Time he continued healthy and every way in good Order, we had him hanged, and opened him, and found that Part of the Inteſtine where it was ſewed, in the left Hypochondrium (far enough from the external Wound, which was made in the right
Fig 155. Hypogaſtrium) firmly attached to the Peritonæum (See Fig. 155, *f.*) and enlarged into a Bag (DDD). The Omentum (G) likewiſe adhered to it, and the Inteſtines there in ſeveral Places (* * *e e*) were grown to one another. In order to view the Cicatrix more accurately on the Inſide, we laid open the Inteſtine according to it's Length, whereby on one Side we ſaw the Lips of the Wound contiguous, (DDD) and connected to the Peritonæum (*f*); on the other Side they were divided, and glued as it were to the contiguous parts of the neighbouring Inteſtines. So that the internal Coat of theſe Inteſtines, filling up the Deficiency of the Gut at that Part, continued the inteſtinal Canal, and ſerved very well to convey the Aliment, *e, e.*

Brunnerus in his *Preface to New Experiments concerning the Pancreas*, mentions his having made a Wound of an Inch and a half long, in the ſmall Inteſtine of a Dog, and he eſcaped with his Life, though with great Difficulty.

The ſame Operation ſucceeded better with Mr *Cowper*, who, in the Acts of the Royal Society, No. 208 †, affirms that he laid open the ſmall Inteſtine of a large Dog according to it's Length, and cured it in a ſhort Time, without ſewing it up (only ſtitching the Wound of the Abdomen) and without any troubleſome Symptoms, and that either with or without Dr Colbatch's Styptick Powder. But neither of theſe two mention their cutting away any Part of the Inteſtines.

† *See above*, V. III. P. i. C. 5. S. 21.

There is an Obſervation of Dr *Wallis* in the Acts of the Royal Society, N. 219 *, not unlike the former. A Horſe in jumping had a Stake ſtuck into his Belly, whereby the Stomach was wounded. A Farrier was brought, but not for ſome Hours after; he enlarged the Wound, ſewed up the Stomach, drew the Lips of the Wound of the Abdomen gently together, put in Tents, and the Horſe got well in a few Weeks.

* *See above* V. III. P. i. C. 4. S. 12.

But I look upon a Wound of the ſmall Inteſtines in Men, to be no leſs Mortal than a Wound in the Heart; for the Fibres of them are not ſo fleſhy in Men as in Dogs, who are uſed to harder Aliments, and ſeem to require more Motion and Heat in the inteſtinal Canal, to elaborate the Chyle, and expel the Fæces, which in them too are for the moſt Part more hard. But although the Art of Surgery is but little employed in the Cure of Brutes, yet it is worth while to make Experiments in theſe, which afterwards may prove to be uſeful to Mankind; and as we ſee the Inteſtine of a Dog, after a Bit of it is taken out, can be united again ſo as to perform it's Function as before, it will make us more bold in ſewing up Wounds of the large Inteſtines at leaſt in Men, and more confident of Succeſs.

A, *a*, *a*, The upper Part of the *Ileum* towards the *Stomach*. B, *b*, *b*, The lower Part of the ſame Inteſtine. C, The Cicatrix of the Wound of the Inteſtine on the Inſide. D, D, D, The Lips of the divided Inteſtine. E, The upper Orifice of the Inteſtine. F, The lower Orifice. *e*, *e*, *e*, The internal Parts of the neighbouring Inteſtines, ſupplying the Place of that Portion of the *Ileum*, which was deficient in this Part. *f*, Part of the *Peritonæum* adhering to the Inteſtine. G, The *Omentum* likewiſe connected to the Inteſtine. * * The Marks of the *Inteſtine* ſeparated, where it was connected with the other. H, H, The Trunk of the *Aorta*. I, The *Cæliac* Artery. *g*, The right *Gaſtrick*. *h*, The right *Gaſtro-epiploick*. *i*, The *Hepatick*. *k*, The *Pylorick*. *l*, The larger *Gaſtrick*. *m*, *m*, The *Splenick* Artery. K, The upper *Meſenterick* Artery. L, The *Phrenick*. O, The Trunk of the *Vena Portarum*. P, P, Arteries and Veins diſperſed through the *Meſentery*.

Nails, Keys, &c. found in the Stomach *of an* Idiot, *by Mr* C. Amijand. n. 317. p. 170.

XVI. One that was an Idiot from his Infancy, died lately at *Oſtend*, in the 33*d* Year of his Age; his Death having been preceded with twelve Days continual remitting Fever, and a conſiderable Tumour and Pain about the Region of the Liver; his Brother, in whoſe Houſe he had been a conſtant Dweller, being deſirous to know the Cauſe of it, deſired Mr *Ricks* to open him, who ſent his Son, and a Servant to perform it. A large Abſceſs, or Impoſthume, was found in each Lobe of the Liver, whoſe Bulk did far exceed the ordinary Stint. In the *Stomach* was found a Bundle of the Things following, cloſely involved and embraced by it; *viz.* Nine Cart-wheel Nails, and ſix leſſer; a large and long Iron Screw; two Pair of Compaſſes, the one having a Circle two Inches in Diameter; a middle-ſize Key; a large Iron Pin, as big as my Thumb, and four Inches long, with a Ring at the End on't; another of Braſs, but much leſs; the Handle of an Iron Spring-Knife, (ſwallow'd, as 'tis believ'd, entire, but the Sides and two Pieces making up the Spring of it, found aſunder; the Pegs of the Knife, tying thoſe ſeveral Pieces together, were not found;) the upper and lower-moſt End of a Braſs Pommel, inſervient to a Sea-coal Grate, weighing nine Ounces; a broad Piece of Lead, weighing three Ounces and a half: The whole conſiſting of 28 Pieces, weighing betwixt two and three Pounds. They were found all in a Bundle with the largeſt End one Way, and the ſmalleſt the other; the ſmall End of one of the large Nails was ſo bent, that it would have made a perfect Circle, had not the very Tip of that ſame Nail been bent back again; this End was forked, and wonderfully ſharp, as were likewiſe the Ends of the Compaſſes. None of the Pieces were found poliſh'd, neither could I find the Braſs or the Lead any ways impaired or endamaged; but the Iron Pieces were extreamly corroded, eſpecially one of the Sides of the Knife, which had lain in the Stomach about eight Months, was eaten quite through in two or three Places, towards the Blade's End; and three or four Nails mightily endamaged, did appear as if ſome particular *Menſtruum* or Diſſolvent had been poured upon them, capable only to diſſolve that Metal, as *Aq. regalis* has the Property to diſſolve Gold, *Sp. Nitri* Silver, *Vinegar* Lead, leaving thoſe other Metals joined and alienated with them, untouched: The Lead had lain in the Stomach about eight Months, and the braſs Pin above twelve. It was very eaſy to gueſs at the Time thoſe different Pieces of Iron had been in the Stomach, in conſidering how much one Piece had ſuffered more than the other. This Obſervation is like to give a Check to the Notion of thoſe who believed that Oſtridges did diſſolve Braſs and Iron by Friction only; for if ſo, I ſee little Reaſon why the Iron Branches of the Compaſſes ſhould have been found ſo very much worn out, and the Braſs Branches not in the leaſt impaired. Mr *Ricks*'s Son, who opened him, told me, That the Stomach had been no ways wounded or endamaged; which does not appear to me probable, when the Patient was known to have vomited and evacuated Blood by Stool for ſix Weeks before he died: It could have been wiſhed the Gullet and Guts had likewiſe been opened; for 'tis plain, ſome of the Pieces had paſſed the *Pylorus*, as the Pegs of the Knife; and perhaps ſome ſmaller Pieces than thoſe that were found in the Stomach, might have been forced thither. This Fellow, from his Youth, had accuſtomed himſelf to ſwallow large Morſels, Glutton like, and without chewing; which, no doubt made the Paſſage of the *Oeſophagus* wider, and diſpoſed it to give Entrance to all thoſe extraneous Bodies. This Idiot, and ſometimes mad Fellow, was never known to ſleep a Wink, tho' he was often compelled to go to Bed, and had, to incline him to ſleep, been very much harraſs'd and fatigu'd before: He was always known to eat three times as much as the reſt of Mankind, and when furious, to grow quiet upon the appaoach of Meat.

An Account of a Stone *voided by* Stool; *which had obſtructed the* Ductus communis Bilarius; *by Dr* W. Muſgrave. *n.* 306. *p.* 2233.

XVII. Mr *Harvey* (Nephew to the celebrated Phyſician of that Name) ſhewed me a *Stone* which he had voided ſome Years ſince, by *Stool*; and which he repreſented to me, as having come from the *Ductus communis bilarius*: But the Largeneſs of it is ſuch, as made the latter Part of the Account ſeem, at firſt hearing, ſomewhat dubious.

Fig. 178.

The Figure of the *Stone* is oval; the Length almoſt an Inch; the Breadth, (or ſhorteſt Diameter) $\frac{7}{10}$ of an Inch: It weighed 59 Grains, when I ſaw it; but at it's coming off, was (as I am informed) above a Drachm in Weight: Some part of it being, by frequent handling, rubbed away. The Surface rough, unequal, divided into ſeveral little Riſings, each about the Size of half a Vetch, or ſomewhat leſs.

The many ſtrong annular Fibres, which appear not only at the Orifice, where the *Ductus communis* opens into the *Duodenum*; but alſo all along the oblique Paſſage of that *Ductus*, between the Coats of the Inteſtine, (which Paſſage is, according to Dr *Gliſſon*'s Meaſure, about half an Inch in Length) do, by way of Sphincter, keep this End of the *Ductus Communis* very ſtrait and cloſe. And beſides the Straitneſs of the *Ductus*, the two oblique Inſertions it makes at ſome Diſtance from one another, thro' the two outer Coats of the *Duodenum*, render it yet more difficult for a Subſtance of any Bulk to paſs this Way. So that however great Stones may be generated in the *Gall*-Bladder, *Ductus Cyſticus*, *Hepaticus*, or *Communis*, it is not eaſy to conceive, how a Stone of the Magnitude here deſcribed, could poſſibly, thro' a Paſſage of itſelf ſo very narrow, ſtrait, and difficult, be conveyed into the *Duodenum*.

From theſe Conſiderations, I was extreamly deſirous to hear what could be ſaid, to prove, That this *Stone* was not form'd in the *Fiſtula* [illegible], but (large, as it now is) came this way into it: In anſwer to which, the Gentleman was pleaſed to let me know, That, before the Diſcharge of this *Stone*, he had the *Jaundice*; which came ſuddenly on him, and continued ſeveral Months, in a ſevere, and moſt exceſſive Manner:

That this *Jaundice*, beſide the diſcolouring of his Urine and Skin, to a very great Degree; beſide Loſs of Appetite, Faintneſs, and many other Symptoms, uſual in this Diſtemper, was alſo accompanied with a Pain (in, or) near the Stomach:

That, during this *Jaundice*, his Stools were of a white Colour, as having very little or no Mixture of *Choler* in them;

That, travelling under theſe Circumſtances, more eſpecially with a conſtant Pain, in his Coach from *London* to *Clifton* in *Dorſetſhire*, and, after a little Time, to *Bath*; he found, a little after his Arrival at *Bath*, this *Stone* come off by Stool; and, together with it, almoſt a Spoonful of *Gravelly Matter*; and a conſiderable Quantity of Choler, as appear'd from the Yellowneſs of the Stools: All which happen'd ſo ſoon after he came to *Bath*, as evidently to prove the Diſcharge of both (Choler and Stone) to proceed from the Motion of the Coach.

That his Deliverance from the *Jaundice*, commenc'd from the Expulſion of this Stone: For, ſoon after that, the Colour of the Skin and Urine, and all the ill Symptoms vaniſhed; and, in a very little Time, (Weakneſs only excepted) he recovered.

Theſe Propoſitions, put together, make a conſiderable Argument, That the Orifice of the *Ductus Communis* (how ſtrait, and how ſtrong ſoever) was, in this Gentleman, ſo far dilated, as to give Way to the *Stone*, here deſcribed; that is, dilated to a Circle, in Diameter 7-10ths of an Inch, in Circumference one whole Inch and 3-4ths.

The *Jaundice* is often obſerv'd to be a moſt ſtubborn Diſtemper, not eaſily yielding to our moſt probable Methods; and many Times to none at all. *Riverius* poſitively affirms, That, when it proceeds from a Stone obſtructing the Current of the Choler, it is incurable: Urging this Reaſon for his Opinion; *Calculus, cum diſſolvi non poſſit, morbum facit incurabilem.* Cap. de *Ictero.*

When the *Jaundice* is thus difficult of Cure, eſpecially when there is a Probability (whether from a Pain fix'd in, or near the Region of the Liver, or from any good Argument whatſoever) that it ariſes from the Cauſe now mentioned; rather than to beat over the ſame Ground to no Purpoſe, it may not be amiſs to adviſe *Exercſe* on Horſeback, in Coach, or any other ſuch Way, as ſhall be likely to diſlodge the *Stone*, and bring it off.

But, to make this Exerciſe effectual, it ought to be violent, as the Patient can well bear it; and in ſuch Manner, as may, by much Agitation of the Body, be moſt conducing to the Deſign in Hand.

An Account of a Ball voided

XVIII. A Girl at *Rawden*, four Miles from *Leeds* in *Yorkſhire*, about fourteen Years of Age, having been tormented with Colical, and, as was ſuppoſed, Nephritic Pains for ſome Time; at length voided a roundiſh Ball, *per Anum*, as hard to feel as a Stone.

by Stool: *By Mr* R. Thoreſby, *n.* 291. *p.* 1595.

After a while, the Pains returning with greater Violence, ſo as to make her roll upon the Ground, ſhe voided another as hard, and much bigger.

Upon which, Mrs *Ward*, a Gentlewoman who had been much afflicted with Gravel, gave her ſome of thoſe Medicines which ſhe us'd to take herſelf. Whereupon the Girl voided a third Ball, alſo *per Anum*, with leſs Pain, yet the greateſt of the three.

The firſt of theſe Balls is ſmooth and gloſſy, of the Colour of a right Hazel-Nut, three Inches about, and ſomewhat compreſſed. The other two rough and gritty, and in like Manner a little compreſſed into a kind of obtuſely triangular Figure. The ſecond is four Inches and a half round about; the laſt, five Inches and a half.

Conſidering their Bulk, all three are very light, eſpecially the two latter and greater ones, of which the laſt weighs but five Drachms thirty-ſix Grains; and both of them ſwim in Water.

This Lightneſs proceeds from the Matter whereof they conſiſt; which, in ſome Places, is purely Downy or Furzy; in others, mixed with a gritty Subſtance, yet not confuſedly, but regularly mixed. The furzy Parts poſſeſs'd the central Part of the Ball, with a ſmall Particle of blackiſh Glaſs, or other vitrify'd Subſtance in the very Centre itſelf. Over which are ſeveral Coats, gritty and furzy, alternately ending in the Circumference with a Grit, much reſembling the Groundwork and Superſtructure of the Oriental *Bezoar* Stone.

The Powder of one of theſe Balls ſcraped off with a Knife, is no way mov'd or affected with any Sort either of Alcaline or Acid Liquor dropp'd thereupon. Neither being burn'd, doth it ſtink, it conſiſts therefore of no Animal Subſtance; but the Girl being of the *Green-Sickneſs* Age, the gritty Parts (with the glaſſy Particle in the Center, as the moſt ponderous and leaſt moveable) ſeem to be broken off of Tobacco-Pipes, and ground ſmall between her Teeth; the downy, or furzy, to be lick'd, or ſcrap'd off the Lean of Mutton, or the Rind of Peaches, or ſome other Part, or Plant; her Stomach kneading the Matter into a Coat, as her changeable Appetite ſupplied it alternately with one or the other Sort.

XIX. In *April* 1704, I was deſired, together with Dr C. of *Tiverton*, to ſee a Woman of that Town, named Mrs *Pear*. She is about thirty, of a tender Conſtitution; had an ill Habit of Body, and about *Candlemas* laſt a Fever; which continuing near three Weeks, was at length overcome by *Teſtaceous* Powders and *Alexipharmacs*, but chiefly by the *Cortex*.

An Account of Hydatides *voided by* Stool; *by Dr* W. Muſgrave. *n.* 295. *p.* 797.

In this Fever ſhe had ſowre Vomitings, and a Pain in her Stomach; which remain'd a long Time; and, after the Fever, was accompanied with a copious Salivation; with Wind, and Pains in her Side, to a Degree extraordinary; under all which ſhe labour'd to the Time of my ſeeing her.

About three Weeks before my Viſit, ſhe was ſeiz'd with a Jaundice, and while taking Medicines (*Pilulas & Decoctum Ictericum* Fulleri) for that Illneſs, ſhe brought off ſeveral *Bladders by Stool*, and continued ſo to do, ſometimes every Day, at other times once in two or three Days, ever ſince the firſt Diſcharge of this Kind, to the Time of my Viſit.

Theſe *Bladders* were of various Sizes; the leaſt that came off, was of the Bigneſs of a great Pin's Head; the largeſt, equal to a Pullet's Egg: They were alſo of differing Colours; ſome white, others more yellow, from the Liquor contain'd in them, which was a Sort of Jelly, like that of Harts-horn, ting'd more or leſs with Saffron.

Before the Diſcharge of theſe *Bladders*, there was (beſides the Symptoms already mentioned) a Coldneſs and Sickneſs at Stomach, almoſt perpetual; with frequent Inclinations to vomit; and Hyſteric Suffocations: Since that Diſcharge, theſe Symptoms are vaniſh'd, and ſucceeded by a Soreneſs of the ſame Part, as if ſomething had been torn there.

The *Bladders* came off without Pain, many of them whole and entire; one of which I ſaw, about the Bigneſs of a large Gall, or Marble Stone: Others were broken, and appear'd not unlike the empty Skins of Currants, Gooſeberries, and Plumbs.

Only one *Bladder* came away by Vomiting, and that broken; but, to all Appearance, had been large almoſt as a Gooſe Egg. The Jelly thrown up with this *Bladder*, and which in all likelihood had been contain'd in it, (before it broke in coming up) was thicker, and more fœtid, than was found in any of the other *Bladders*.

The Number of thoſe which came off by Stool, made ſeveral Scores.

During the whole Courſe of this Illneſs, the Patient was rather looſe than coſtive; had no manner of Appetite, and ſeldom ſlept without an Opiate.

I found her much waſted in Fleſh, with a dead, pale Look; ſuch as argued her to be very low. She had Stools of an unuſual Smell, no way natural, and had vomited a deal of cold Phlegm.

She was very willing to think theſe *Bladders* came from her Stomach, and urg'd the following Reaſons for her Opinion; *Firſt*, for that, had they been originally in the Bowels, in all Likelihood the Purges, (of which ſhe took many in the *Jaundice*) would, as ſhe ſaid, have carried them off much ſooner. *Secondly*, From the (almoſt) conſtant Pain of her Stomach, and frequent Inclination to vomit, ever ſince her Fever, to the Time of the *Bladders* being diſcharged. *Thirdly*, From the Rawneſs and Soreneſs of her Stomach, after the *Bladders* came off.

Theſe were her Reaſons; and, I think, they may be eſteem'd ſo far of Force, as to prove, That ſome, and perhaps a great Number of theſe *Bladders*, came from her Stomach.

There was no Appearance, in any one of theſe *Bladders*, of ſuch an Order of Parts, or Organs, as ſhewed them to be Inſects; nor upon Examination was there any Animal diſcerned in the Liquor contained in them; theſe Obſervations indeed were made only by the naked Eye.

The Medicines given, after I was called in, were chiefly of the *Vulnerary* and *Digeſtive* Kinds: That which did her moſt Service, (but it was after the *Bladders* were come off) was a *Tincture of Myrrh and Gentian*, in large and frequent Doſes; and with a proper Vehicle: Under the Uſe of this Medicine, from a very weak Condition, ſhe recovered an Appetite, *&c.* and is now perfectly well.

An Account of Hydatides *voided with the* Urine; *by* Dr Davies. *n.* 273. *p.* 897.

XX. A Gentlewoman between forty and fifty Years of Age, in the Autumn drank ſome Aluminous Waters for a Month or five Weeks, and in a Month's Time, after the Uſe of theſe Waters, found a Pain in the Renal Region, where ſhe never had been afflicted with any before: This Pain returned after the firſt Paroxyſm in about a Month's Time, and afterwards more frequently, till about the *Chriſtmas* following, it viſited her every Day; about which time ſhe ſent for me; and had, when I came to her, the Symptoms of a Stone in her left Kidney, *viz.* a grinding, and ſometimes a very acute Pain on that Side of the *Spina Dorſi*, a Vomiting, her Urine during the Paroxyſm tinged with Blood, and in it bloody *Ramenta:* But what moſt ſurprized me, was a dozen at leaſt of *Hydatides*, ſome of the biggeſt of them 1 ½ Inch long, their Circumference equalled that of an ordinary Gooſe-Quill; in Shape they exactly repreſented the *Veſiculæ Natatoriæ* in Fiſh, growing ſmaller about the middle, as thoſe generally do, and were filled with a Liquor, which my Taſte and Smell made me believe to be Urine; I never diſcovered any Pus in her Urine, nor had ſhe any Pain at the Sphincter of the Bladder, nor in the *Meatus Urinarius*, either before, at, or after making Urine. The Paroxyſm laſted generally three or four Hours; as ſoon as theſe *Hydatides* came away, (which they did not all at once making Water, but at ſeveral Times) the Pain in her Back, *&c.* abated very ſenſibly, and ſhe continued eaſy and well the reſt of the Day, excepting an external Soreneſs, which the Pain had cauſed. I thought theſe *Veſiculæ* at firſt to be membranous, ſince their Conſiſtence was ſo tough as to bear taking out of the Chamber-pot, and gentle handling; but afterwards was convinced that they ow'd their Origin to a glutinous ſlimy Matter; becauſe upon long ſtanding in Urine, or fair Water, they quite diſappeared and were diſſolved, making the Water, or Urine, to look thick and turbid. By the Uſe of Medicines all theſe Symptoms diſappeared, and ſhe continued well.

An Account of a Bunch of Hair *voided with the* U-*rine; by Mr* J. Yonge, *n.* 323. *p.* 414.

XXI. 1. A Plethoric Woman about fifty Years old, that uſed often to be afflicted with Nephritic Pains, deſired my Aſſiſtance. I found by the Purulency and Stench of her Urine, that ſhe had not only Stones and Gravel, but an Ulcer in one or both her Kidneys; and therefore gave her a Doſe of *Cantharides* with *Camphire* made into Pills, and followed it with plentiful Draughts of a ſlippery Emulſion. This made her piſs off abundance of blackiſh Gravel, and white thick Matter like Bird-Lime, without any Pain or ill Symptoms, and ſhe continued eaſy for a Week; then her Pains returned, and went off by the ſame Remedy. About eighteen Days afterwards, her Pain ſeeming to threaten a Return, I repeated the Medicine; but that Night it gave her very great Pain in the Side of her Belly, and at laſt threw her into Convulſions, which went off upon the Diſcharge of Urine, of a great deal of Matter, and in it a Bunch of ſhort Hair, almoſt rotten: For ſome Time after ſhe uſed a Nephritick Courſe, which hath hitherto preſerved her from the Return of Pain, Matter, Stones, and Impediment of Urine.

I herewith ſend a third part of that Bunch, which the laſt Doſe of *Cantharides* forced from her.

—Obſervations *on the* Bunch *of* Hair, *by Mr* Lewenhoeck, *ibid. p.* 416.

2.] I viewed part of the *Hairy Subſtance* thro' a Microſcrope, and judged it to be the Hair or white Wool of a Sheep; which Wool was broken into ſuch ſmall or ſhort Particles, that ſome of 'em were no longer than ſix Diameters of the Breadth of a Hair; which I ſuppoſe could not proceed from the Body of a Man, but that it was rather found in the Heel of one's Stocking. And the oftner I repeated my Obſervations, the more I was confirm'd in my Opinion; for I could not only diſcover the ſhort broken woolly Particles, but I ſaw alſo a great Number of the Ends grinded to pieces as it were; inſomuch that not only the Bark (if I may ſo call it) or Outſide of the woolly Particles were rubbed off, but the inward little Hairs, of which the Wool is compoſed, were ſo divided from one another, that they appeared with their Ends like little Bruſhes.

Moreover, under the ſaid Stuff, or white woolly Parts, there lay very ſmall Particles compoſed of exceeding ſlender little Tubes, or Pipes, which I look'd upon to be ſmall Bits of Straw, and they were ſo ſmall that one Grain of Sand could cover them: There were likewiſe other ſmall Particles of the ſame Figure, but I did not take them to be Straw, but rather the outmoſt Huſk, or Skin of a Grain of Wheat, or Rye; and under thoſe, I ſaw one Particle covered all over with ſmall Hairs, ſuch as we ſee at the Top of Wheat or Rye; as likewiſe ſome few little Bits of Wood, ſomewhat thicker than a Hair of one's Head: There was alſo a ſmall Particle of the outmoſt Skin of a Man, for I could ſee the little Scales of which our outmoſt Skin is compoſed, very plainly: Now theſe Particles that were not Wool, might be very eaſily brought into the Stocking, in Caſe one ſets one's bare Foot upon the Floor before one puts it on.

There lay moreover, in the ſaid Matter, an unſpeakably great Number of exceeding ſlender long Particles, which I imagine to be thoſe hairy Particles, of which a little Fibre of Wool (ſetting aſide the Bark or Skin of it) is compoſed; as alſo ſeveral earthy Particles, which I took to be Part of the Dirt of the Floor, or of the Foot itſelf.

There alſo lay a great many particular little Figures, which I could not diſcover what they were; and theſe laſt mentioned Particles were ſo ſtrongly joined to ſome little Hairs, or Wool, by the perſpir'd viſcous Matter from the Foot, as I ſuppoſe, that I could not ſeparate 'em but by the Help of ſome Water: Amongſt others, I alſo ſaw two ſlender Particles lying, which I ſhould likewiſe have taken for the outmoſt Skin of a Man, were it not that they were larger than any of the Scales that I could ever take from my Skin, which are moſtly of an equal Thickneſs. In ſhort, there appeared to my Sight ſo many, and ſuch particular Figures, that there was no account to be given of them; only I obſerv'd amongſt them one ſmall Particle, not of a ſingle Feather, ſuch as it appears to our naked Eye upon the Body of a Bird, but rather of the fineſt Down; and the more I unravelled, or ſeparated the Particles of Wool from one another, ſtill the greater Reaſon had I to judge, that the Perſon who had worn the Stocking, had been uſed to go often bare-footed upon the Floor.

Now, ſuppoſing that theſe woolly Particles might have fallen into any Spoon Meat thicker than ordinary, the Perſon might ſwallow it down without being aware of it.

Now my Reaſons for gueſſing that theſe woolly Particles ſhould come out of a Stocking, and that *that* ſhould be occaſioned by the Motion of the Foot, are theſe that follow: I myſelf always wear heavy white Woollen Under-Stockings; and having ſeveral times view'd the broken woollen Particles which lie in a Heap, as it were cleaving together, under the Heel, and having alſo ſingled out of them ſeveral Fibres, or Threads of Wool, to prove that they are compoſed of little Hairs, and theſe woolly Particles exactly agreeing with thoſe that were ſent to me, I could no longer doubt that the ſaid woolly Particles that were ſo ſent to me, were any way different from thoſe Particles that were found in the Heel of the Stocking.

—*On the ſame, by Mr* J. Yónge, *ib. p.* 420.

3.] I have again examined the Woman from whom the Bunch of Hair came, as alſo her Daughter, and Servant that attended her when it was ejected; and they all affirmed that the Chamber-pot uſed was a white glazed one, and very clean; and the Woman tells me ſhe ſenſibly felt it when it came away, and that a Tumour which ſhe felt in one Side of her Belly, did thereupon vaniſh. That ever ſince, which is eight Months, ſhe hath been unmoleſted with thoſe Torments, and other Symptoms which ſeized her frequently before; only now and then ſome ſmall Pains happen about her Loins; and ſometimes ſhe brings off Mucilage in her Urine.

I am not very credulous, nor did I ſoon believe it poſſible for Hair to paſs through thoſe Ways, by which the Urine is convey'd to the Kidneys, &c. But when I conſidered all the Circumſtances, and how frequently Things unaccountable happen, the Reality of which we are well aſſured of, I make no doubt of it's Truth.

—On the ſame, by the ſame. *ibid.* *p.* 424.

4.] I find that the Account I gave of the *Hairy Bunch* ejected by Urine, did not meet with that Regard and Credit which I think it deſerv'd. I own, that Mr *Lewenhoek*'s Objections ſeem to have ſome Strength, but cannot ſhock my Belief at all. For beſides a nice Examination, and full Conſideration of all the Circumſtances at firſt, I am confirm'd in the Aſſurance I then had, that it came thro' the *Urethra*, and was not convey'd, or by any Accident dropt into the Pot, by ſuch Evidence, *à poſteriori*, as is little ſhort of Demonſtration; *viz.* that the Tumour which was in the Side of her Belly, in which her chief Anguiſh lay before the Evacuation, vaniſh'd with it; together with all thoſe other Symptoms which moleſted her, *viz*, Strangury, fœtid and purulent Urine, and have not now (in two Years time) made any Return.

An Account of ſeveral Solid *Bodies* voided *with the* U-*rine; by the* ſame. *ibid.* *p.* 420.

XXII. Tho' it be difficult to account how Solid Bodies, which have come away with the Urine, could paſs thro' thoſe Ways by which the Urine is conveyed to the Kidneys, &c. yet Authors of good Credit have given us many Caſes of this Kind.

Diemerbroeck Anat. lib. 1. *c.* 17. mentions divers of his own knowledge, and many more from *Plutarch*, *Langius*, *Alex. Benedictus*, *J. M. Heſſius*, *J. Alexandrinus*, *N. Florentinus*, *P. Pigræus*, and others, That Needles, Lumps of Fat, Iron Keys, Roots, Seeds, Nails, &c. have come off in Urine. To theſe may be added *Tho. Bartholinus*, *Act. Med. Vol.* 2. *Obſ.* 125. *Vol.* 3. *Obſ.* 68. *Vol.* 5. *Obſ.* 57. 70. as alſo in his *Tr. de Lac. Thorac. Cap.* 6. 9. *Fabr. Hildanus*, *Cent.* 5. *Obſ.* 51. who write of Pins, &c. caſt off by Urine. But Dr *Fairfax*, writes of one more ſtrange; * That a Leaden-bullet ſwallowed by a Woman for the Cholick, was piſs'd off ſome Years afterward, incruſtated with a gravelly, gritty, and ſtony Accretion.

† *Vid.* Supra V. III. P. I. C. IV. S. LXXX.

About twenty Years ſince, I was aſſured by a Phyſician practiſing in the Weſt part of *Cornwall*, that he knew a Woman that piſs'd out a ſmall Plumb-Stone. But there happen'd at *Loo* in the ſame County, about 16 Years ago, a more ſurpriſing Accident of that Sort, which I here give as I had it from the Pen of (Dr J. H.) the Phyſician concern'd, who is alive, and the Truth of it well known in and about the Town where it happened.

‘ *Nathaniel Mitchell* of *Loo* in *Cornwall*, aged about 50, was in the ‘ Summer 1690, ſeized with violent Colical Pains, which he mitigated

‘ by Glyſters, but could not perfectly free himſelf of them. About
‘ *Michaelmas* 1691, his Pains being very violent, he was relieved by
‘ the ſame Remedy; and by the Perſwaſion of a ſkilful Woman, he
‘ drank the Powder of Nettle-roots in White-Wine: After the firſt or
‘ ſecond Doſe he diſcharged a great Quantity of Urine, with a very
‘ feculent Sediment. About the Beginning of *November* 1691, being
‘ Coſtive, he eat Mallow-roots and Corinths boiled and mixed with
‘ Butter (his uſual Medicine to render him laxative). In a little
‘ Time after eating it, he was much diſordered, and complained of
‘ an Oppreſſion of Wind; at length the Wind (as he termed it) ſettled
‘ at the Bottom of his Belly, and in a very little time with his Urine
‘ he emitted ſome of the Herbs, with above 40 Corinths: A few
‘ Days after he piſs'd off ſeveral Parſley-leaves, which he had a little
‘ before eaten. I was called to him about the 12th of *November*, when
‘ his Urine being ſhewn me, I thought that part of his Excrements
‘ had been evacuated that way, and that ſome latent Ulcer had
‘ made a Paſſage through the *Inteſtinum Rectum* into the Bladder, but
‘ found it otherwiſe; for there was no Fœtor in the Urine, he had no
‘ *Teneſmus*, nor bloody, nor purulent Dejections; but to ſatisfy myſelf
‘ further in this Particular, I ordered him a Glyſter tinctured with
‘ Indigo, which he retained above half an Hour, but his Urine was
‘ not at all diſcoulered with it. I preſcribed Pills of——, two of
‘ which came off in his Urine *November* 18, in an oblong Form, about
‘ the Bigneſs of the End of the firſt Quill in a Gooſe's Wing. The
‘ Pills I have by me, except the half of one, which I rubb'd abroad
‘ with my Fingers. Some time after he piſs'd out a Piece of a Raiſin.
‘ He lived till *Midſummer* 1692, in which time he ejected, at divers
‘ Times, Parts of Roots, and other Things he eat.’

His Wife reſiſted all the Importunity that could be made to have his Body diſſected.

Diemerbroeck, *Fairfax*, *T. Bartholine*, *O. Borichius*, *N. Blegny*, Mr *Pecquet*, and others, are of Opinion that there is a concealed Channel for the Urine to the Emulgents, *&c.* than thoſe commonly ſuppoſed; and they think it appears ſo by divers Phænomena, and Experiments, though it be yet concealed. 'Tis certain, the Matter of an *Empyema*, and the Corruptions in the Thorax in penetrating Wounds thereof, have been piſs'd off, and to that Purpoſe Diuretics are uſed in Vulneraries, *&c.* See *Malpighius*, *N. Blegny*, Serjeant *Wiſeman*, &c. And I have known a large ripe Apoſtumation in the Thigh ſink ſuddenly, and all the Matter come away by Urine from a Woman. Mr *Leyſer* hath the like Story in his *Obſervations*.

I had once a Boy of about ſix Years old brought me, that piſſed off the moſt part of his Urine from an Orifice in his Navel. I remember *Blaſius*, or *Veſlingius*, relates the like, and accounts for it.

An Account of two Large Stones *voided by the* Urethra; *by Dr* T: Bullen. *Communicated by Mr* E. Lhuyd. *n.* 295. *p.* 1804.

XXIII. The following Account (of two *Large Stones* voided by the *Urethra*) I received from Dr *Bullen*, a Phyſician in *Cheſhire*. They are much of the ſame Size and Shape; and being joined together, the Circumference one way is above three Inches and a half, and the other three and a quarter.

The Perſon that voided them took an exceſſive Quantity of *Honey* during his Illneſs, to which alone he attributes his Deliverance.

Thomas Olton, a Man of ſeventy Years of Age, living not far from *Malban*, in *Cheſhire*, being grievouſly afflicted with the Stone in the Bladder, applied to me and other Phyſicians, ſeveral Times for Aſſiſtance, and had a great many things given him, without any Relief. At laſt however, in one of the Paroxyſms, which was the ſevereſt he ever had, he voided two Stones by the Urethra, exactly reſembling in Figure theſe two Braſs Models of them, ſent lately to the Muſeum at *Oxford*, by Sir *R. W.* and they weighed ſeparately upwards of two Drachms.

Fig. 156.

The firſt Stone gave him intolerable Pain in paſſing; but he ſcarce felt the ſecond: And indeed no Wonder, that the Urethra, after being ſo dilated and tore by the firſt, ſhould afford an eaſy Paſſage for the other. But theſe two Stones made only one while in the Bladder, which appears plain upon joining them together where they were broke. The Wound in the Urethra being neglected, remains ſtill open; and he is obliged to make uſe of a large Horn, adapted to the Root of the *Penis*, when he wants to make Water, to hinder it from ſpoiling his own Cloaths, and thoſe of other People, who happen to be nigh him upon theſe Occaſions.

Fig. 156.

All this I affirm to be true, and the Truth of it is well known to ſeveral others in that Part of the Country. But if any one happens to be doubtful about this Caſe, I would adviſe him to conſult *Schenkius*'s Obſervations upon the *Stone* in the *Bladder*.

An Account of the Diſſection *of a Perſon that died of the* Stone; *by Mr* R. Thoreſby. *n.* 336. *p.* 536.

XXIV. A young Man, one *Joſhua Spurrit*, near *Leeds*, having been for a long time ſadly afflicted with the *Stone*, was the laſt Year tormented in an extraordinary Manner. I have three Stones that he voided, which are of a great Bigneſs to paſs the *Penis*, and five more that he could not get rid of without the Aſſiſtance of Mr *Pollard* a Surgeon at *Leeds*, who, by an Inciſion, made way for them, as they came ſeverally near the *Glans*. Whenever one of theſe great Stones broke out, there was a Crack within his Body, as if the Sphincter Muſcle, or the Bladder itſelf, was rent. At length he died of this Diſtemper, and was diſſected: There were found in the Top of his Bladder (which was contracted like a Purſe) two prodigious large Stones, one of which I meaſured, which was rather more than five Inches and a half one way, and four the other way; it weighed two Ounces wanting three Drachms; the other weighed but one Ounce and one Drachm: There were two very odd Stones taken out of the right

Fig. 151.

Fig. 153

Fig. 152

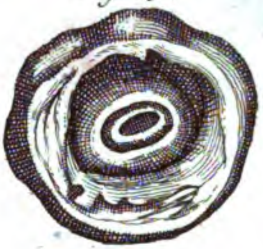
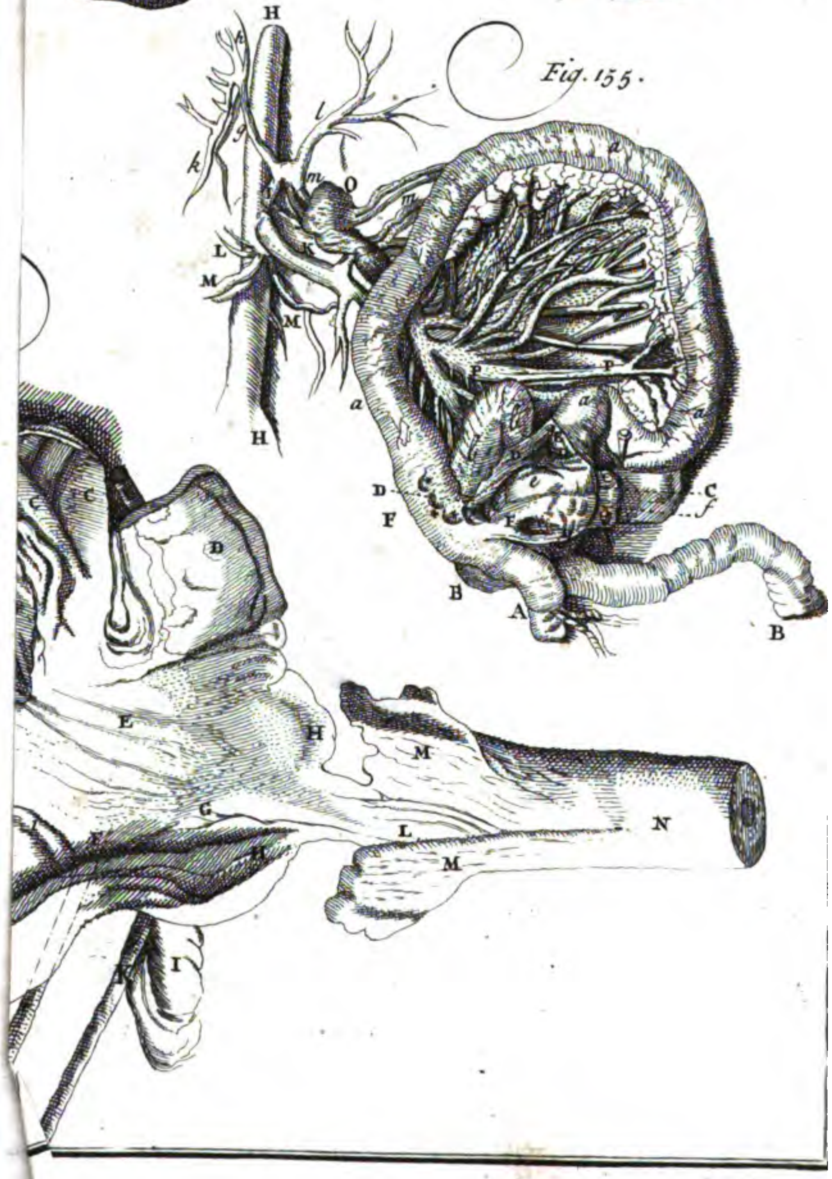


Fig. 155.



right Kidney; (the left was wholly degenerated into a kind of Mucilage); and betwixt the Neck of the Bladder and the End of the *Penis* (which was mortified thereby) half a dozen large Stones.

There was little Moiſture in the Bladder; the Ureters being broken off, and almoſt wholly conſumed.

XXV. In order for the Improvement of the *Therapeutick* Part of the Diſtemper of the *Stone*, it would be highly proper,

Experiments *relating to the* Cure *of the* Stone, *propoſed by Dr* F. Slare. *n.* 157 *p.* 533.

To ſearch after innocent *Menſtruums* that may diſſolve the *Stone*.

To examine the Condition of the *Urine*, ſometimes before a *Paroxyſm*, both as to it's *ſpecific Gravity* and Contents.

And alſo during the *Paroxyſm*, to retard the painful Water ſometimes tranſmitted.

To enquire into the *Nature* of *Nephritic* Medicines.

To examine *Lithontriptics*, ſo as to exclude thoſe from that *Claſs* and *Character*, which have no relative Virtue that way; and to leſſen the *Catalogue* of thoſe miſtaken *Specifics*.

To enquire into the *Nature* of the *Hop*, which is ſo much (and perhaps innocently) condemn'd, for it's Aptneſs to generate the *Stone*.

To explain the Manner of the *Operations* of ſome *Medicines*, which, tho' they are not *Lithontriptics*, yet may be good *Nephritics*.

XXVI. If the Bodies of Perſons that die of extraordinary Diſtempers were often opened, perhaps it would be found that thoſe Effects which had been attributed to the Alteration of the Blood or Humours, might depend merely on an extraordinary Conformation of the Parts of the Body; an Inſtance of which we have in the *Triple-Bladder*, found lately in the Body of Mr *Booth*, which was a very remarkable Caſe: We have been told of a Double Bladder found in the Bodies of ſome Men, (as there was in the Body of the famous *Caſaubon*) but I never met with any Author who mentions any thing of three Urinary Bladders found in one Perſon.

Of a Triple Bladder; *by Mr* Buſſiere. *n.* 268. *p.* 752.

This Gentleman in his beſt Health could not make his Water in a full and continued Stream, the Urine running out by little and little, and with great Efforts of Inſpiration, chiefly when there was but little Quantity of it in the Bladder, which did fatigue him very much, tho' the paſſing of the Urine through the Neck of the Bladder was not ainful: Except the two or three laſt Years of his Life, becauſe of a ick *Mucus*, which then was diſcharged with the Urine.

That *Mucus* growing in greater Quantity of late, made him apprehenſive it had been cauſed by a Stone in his Bladder; upon ſuch houghts he apply'd himſelf to one, in order to be ſearched by him, ho accordingly introducing his Catheter, and meeting with ſome eſiſtance in his *Urethra*, did force the Catheter thro' the Membranes, d made ſuch a Dilaceration in them, that the Patient loſt immediately a great Quantity of Blood; which Bleeding continuing for ten Days, without his ſeeking for any Help, brought him under very great Torments by reaſon the Blood being grumulous in the *Urethra*, could not be forced out but by very violent Efforts and acute Pain, which cauſed a Mortification in the Part, of which he died.

The next Day after his Death I opened the Body in the Preſence of Drs *Dawes*, *Chamberlain*, *Woodward*, Mr *Bernard* the Chirurgeon, and ſeveral others; in which the natural Urinary Bladder was found lying on the left Side of the *Pelvis* upon the *Ilium* Bone; then ſearching what ſhould be the Cauſe of an unnatural Situation, we found one large and round Bag, lying under the *Pubis* upon the *Rectum*, filling up all the Cavity of the *Hypogaſter*: In order to examine the thing more exactly, I diſſected the *Penis* and the *Rectum*, and having taken them out of the Body, and laid them upon a Table, laid open the *Urethra*, to examine whether there was any Carnoſity, as the Chirurgeon, who firſt introduced the Catheter had ſuſpected; but there was none: And that *Ductus* was as plain and ſound as could be, except the Dilaceration which the Catheter had made in it; then having introduced a Conductor into the Bladder, I divided it quite; and firſt it was obſerved, that the round Bag, which was made up of two Bladders, or rather two *Ciſtis*'s, divided one from the other only by a Membrane; that which was next to the true Bladder was ſomething bigger than the Bladder, the other which was lying on the right Side being much Fig. 157. leſſer; each of theſe two *Cyſtis*'s had it's Orifice open in the Neck of the natural Bladder, which was longer than it is naturally.

Neither of the *Ureters* were inſerted into any of theſe *Ciſtis*'s; but they were inſerted into the Neck of the true Bladder, by the Orifices of the two *Ciſtis*'s, inſomuch that the Urine could be equally received by them and the Bladder.

Secondly, It was obſerved that the Glandules of the true Bladder were extraordinarily big and red; that Colour being, very likely, the Effect of the Inflammation cauſed by the Dilaceration of the *Urethra*. I have often-times obſerved, that a thick *Mucus*, which runs out of the Bladder, and which ſome think to be the Matter of an Impoſtume or Ulcer in the Kidneys, is only produced by thoſe Glandules of the Bladder grown ſcrophulous; and that when that *Mucus* groweth thick and clammy, it cauſeth the ſame Pain on the Neck of the Bladder, as if it were a Stone.

The Glandules of the great *Cyſtis* were very ſenſible, but very ſmall; they were not all ſenſible in the ſmaller *Cyſtis*.

Now it is eaſy, by the Deſcription of theſe Bladders, to give a Reaſon of the Symptoms this Gentleman did undergo; for by the Situation of the Great *Cyſtis*, it is plain, that the Water could not come out but by the Force of the Inſpiration, it's own Muſcles being not able to force it out, and conſequently could not come out but by little and little; and theſe Efforts of Inſpiration were to be the greater when there was but little Quantity of Urine, becauſe it required greater Force to make it aſcend from the Bottom of the *Cyſtis*, which could not be done but with great Labour and Fatigue.

Fig. 157.

A, A, The Body of the *True Bladder*; 1, 2, 3, 4, 5, 6, it's *Glandules*. B, B, The Great *Cyſtis*. C, C, The Smaller *Cyſtis*; 1, 2, 3, it's *Wrinkles*. D, Part of the *True Bladder* overturned. E, The *Neck* of the *Bladder*. F, F, F, F, The two *Urethra's*. G, The *Inſertion* of the *Spermatick Veſſels* in the *Urethra*. H, H, The *Proſtrates*. I, I, The *Veſiculæ Seminales*. K, K, The *Vaſa Deferentia*. L, The *Urethra*. M, M, The *Muſculi Erectores*. N, The *Penis*.

An Account of the Diſſection *of a* Dropſical *Body; by Mr* J. Laſage, *n.* 299. *p.* 1977.

XXVII. I opened a Maiden Lady 52 Years of Age, who complained, about ſix Weeks before, of a Circonſcript hard Swelling on the *Hypogaſtrica regio*, on the right Side; from that time her Belly grew by degrees to an exorbitant Bigneſs, the great Weight whereof was the moſt conſiderable Symptom, and at laſt ſuffocated the Lady. The Body was mightily emaciated, and the Legs ſwelled a few Days before her Death.

I expected Water, but there was only a viſcous darkiſh Humour, to the Quantity of 18 Gallons: After the Evacuation of that Matter, I perceived a large Heap of Veſicles ariſing from a thick Membrane covering the Guts, it being the *Peritonæum* ſeparated from the Muſcles: I took it out, to examine the better thoſe Veſicular Bodies diſpoſed on the outward Surface of that Membrane, as alſo them that were on it's Inſide, towards the Guts. The Veſicles were of different Magnitude; ſome of the largeſt had been broken and ſunk, others were broken and almoſt empty, and the others very much diſtended and full; the Matter of all of them was of the ſame Nature with the extravaſated Humours. What was contained in the leſſer ones proved to be of different Colour and Conſiſtence, not unlike Jelly, White of Eggs, Gall, and Honey; in ſome it was much like the Humour of a true *Meliceris*.

There was but little Matter extravaſated in the Cavity of the *Abdomen*; moſt part was contained betwixt the *Peritonæum* and the Muſcles.

The right *Kidney* was affected with a particular Dropſy; all the *Viſcera* beſides were in a natural State; two *Polypus's* were found in the *Heart*, and two pretty big Stones in the *Gall-Bladder*.

—Another— by Mr H. Vaughan, *n.* 281. *p.* 1245.

2.] Some time ago I diſſected a poor emaciated Creature that died of a *Dropſy*, from whom I took about ten Gallons of Liquor meaſured.

An Account of an Hydropical *Caſe with the*

XXVIII. Mrs *Dyer* was about 30 Years old, a Mother of ſeveral Children, and was very healthful till *January* 1711; when after frequent Watching upon an extraordinary Occaſion, ſhe was vexed with

Gall-Bladder *very much* diſtended; *by Mr* J. Yong, *n.* 333. *p.* 426.

with a Pain in the Belly like the *Cholic*, which proved to be the Dropſy *Aſcites*; which increaſed ſo faſt, in ſpite of all I could do to help it, that on *March* the 9th, ſhe being almoſt ſuffocated, I was forced to tap her with a hollow Needle in the uſual Place; and to repeat the Operation as often as ſhe filled: And by that way I diſcharged the ſeveral Quantities of Water at the Times here mentioned.

		Pints.
March	9th I drew off	9
	14	8
April	2	12
	16	10
May	17	14
	31	14
June	14	14
	24	14
July	7	17
	21	16
	30	16
Aug.	6	14
	17	14
	26	13
Sept.	1, 6, & 22	11½
Octob.	1	3
	30	15
		214½

In the Space of eight Months I drew two hundred and fourteen Pints and a half of Water. All the while I was pumping that out, I endeavoured by all the Means I could to ſtop the Leak within, but in vain: She died *November* 4, 1711, and opening her Belly, we found the following remarkable Things.

From the Belly iſſued fourteen Pints of a greeniſh *Serum*, mixed with a very purulent Matter, not a little fœtid.

The *Inteſtines*, eſpecially the *Colon*, almoſt every where livid, and adhered in many Places to the *Peritonæum*, although they had been ſo long immerſed in Water.

The *Omentum* was alſo black, and almoſt conſumed.

The *Liver*, which I expected to be indurated, was free of all Faults, only two ſuperficial Ulcers on the left Lobe.

Both that and the *Peritonæum* (which are uſually full of *Hydatides* in Dropſical Perſons) were wholly free of them: But on the Stomach and Guts were many ſuch.

We found a great Bladder, diſtended like that of an Ox, filling up almoſt the whole Region of the *Liver* and *Ventricle*, and adhering

ing to the adjacent Parts ſo firmly, that we could not ſeparate them without difficulty and get it out whole; which proved to be the *Gall-Bladder*, and by it's Diſtention had torn the *Liver* aſunder, one Part of which adhered to the left Side of this monſtrous *Cyſtis*, and another Part behind it, towards the Back; and both expanded with it, and faſtened to it, like as the temporal Muſcle to the *Skull*.

The whole weighed ten Pounds and twelve Ounces. It had no Paſſage to let out the Matter it contained, although we ſqueezed it hard to that Purpoſe; nor could we find any by Probes: So that we were forced to make way by a Knife, and ſo let out of it ſeven Pints of a black Liquor, like *Coffee*; which having ſtood one Night in a Baſon, near a Quart of thick yellow *Fæces* ſubſided.

The Liquor in this Bladder, and what we found in her Belly after her Death, added to what was evacuated before by *Parucenteſis*, amounts to 235 Pints.

Beſides the prodigious Quantity of Matter which filled this great Bag, we found ſeveral Pieces of Membranes, like Guts, or Bladder cut into Pieces.

It was very wonderful, that during the whole Time of her Sickneſs, ſhe ejected by Urine near as much as ſhe drank; and yet by Computation, ſhe leaked into the *Abdomen* near a Pint every twenty four Hours, from *March* to *November*.

When her Belly was near full, her Thighs and Legs uſed to ſwell, and grew diſcoloured, like an approaching *Gangreen*; but both went off after Tapping, by the help of Friction and a warm Lotion.

An Account of a prodigious Dropſical *Woman* diſſected, *&c. by Dr* Hollings. *n.* 348. *p.* 452.

XXIX. A married Woman, near *Haman*, above three Miles from *Shrewſbury*, about the 40th Year of her Age, had then firſt the common Reaſons to believe ſhe was with Child; at the Time of her Account ſhe had the uſual Signs of Labour; and a good Midwife, though miſtaken, aſſured her it was ſo; but the Child was ſo big, ſhe could not be delivered without bringing it away in Pieces. She not ſubmitting to that, her Pains ſoon went off, and ſhe continued without any other Diſorder nine Months longer, when ſhe again had the Signs of Labour; and the ſame Midwife aſſured her as before; and ſhe perſiſting in her former Reſolution, her Pains, after a Day or two, went off. Soon after her Belly ſwelled to a ſurprizing Size. I ſaw her firſt above twenty Years ſince, when her Belly was almoſt even with her Chin; the Weight of it ſo great, that ſhe was obliged to ſupport it with a Stool. She could not ſtand without the Help of a Rope from the Cieling, which aſſiſted her in changing her Poſture of Sitting. She ſlept commonly with her Arms folded on her Belly, and her Head reſted between them. She had no Swelling in her Legs: Every other Part emaciated as uſual in the like Caſes. Thus this Creature lived, without any other conſiderable Complaints, above thirty Years. She died in *May* 1715, when this appeared to be an *Aſcites*.

I need not mention the State the common Teguments muſt neceſſarily be in, from ſo great a Diſtention, which had diſtorted many of her Ribs, and forc'd the Diaphragm ſo high, that it was ſurprizing to find her Breathing could be ſo long continu'd. The Water was all contain'd in the Duplicature of the *Peritonæum*, thirteen Gallons, beſides a Quart that was ſpilt: It was ſaltiſh, with ſome little Fat upon it, and towards the latter Running ting'd with Blood, as uſual. There was not any Water in the Cavity of the *Abdomen*, except what was contain'd in a kind of Bladder of the Shape in *Fig.* 158, which lay a-croſs the *Fundus Uteri*. This was divided by a Cartilaginous Subſtance into two Cavities; in one there was a Pint and a half, in the other three Parts of a Pint of Water. I believe it was this (I know not how) impos'd on the Midwife. The *Uterus* was of the natural Size, without any Alteration, except that the *Os Tincæ* and *Collum Minus* were fill'd with a gritty Subſtance, hard as Stone, which I take to be the Humour ſeparated there, and coagulated by Time. Mr *Cooper*, *Tab.* 15. *Fig.* 4. ſays, he found the ſame Parts fill'd with a glutinous Matter, which he thinks is uſeful to prevent Abortion; which, if vitiated, Impregnation is hinder'd.

Fig. 158.

The Liver, and other Parts contain'd in the *Abdomen*, were forced into an incredible ſmall Compaſs (and by that Preſſure a little chang'd in Shape) to perform their Office ſo long: To which the Muſcles of the *Abdomen*, diſtended ſo as to be ſcarce diſcernible, could give but little, if any Aſſiſtance.

Her Friends would not let me make any farther Enquiry; ſo that I can ſend no Account of any other Part. I was hinder'd too from examining another Woman, who died here about a Week after of an *Aſcites*, which ſhe had had forty Years, any farther than to be ſatiſfied ſhe had ſeven Gallons of Water contain'd between the Duplicature of the *Peritonæum*, and none in the Cavity of the *Abdomen*.

An Account of an Hydrops Ovarii. *With a* Figure *of the* Glandulæ Renales, *and of the* Uterus *in a* Puerpera; *by Dr* J. Douglas. *n.* 308. *p.* 2317.

XXX. I lately open'd the Body of a Woman, aged Twenty-ſeven, who died the third Day after Delivery, on which I made the following Remarks.

She meaſured round the Waſte a Yard and three Quarters; and from the *Scrobiculus Cordis*, to the *Os Pubis*, a Yard and a Quarter.

All the *Cutaneous* Veins of the *Abdomen* were of a very unuſual and extraordinary Bigneſs, and very much diſtended with Blood. From the largeſt of them, being opened, I extracted ſeveral *Polypous* Concretions.

The *Cuticula*, from the *Umbilicus* downwards, was rough and ſcaly to the naked Eye: In ſeveral Parts it appear'd gangren'd, occaſion'd, probably, by the Sharpneſs of the *Serum*, that always ouz'd out of it, when ſhe ſcratch'd the little Pimples or Wheals that aroſe on it's Surface; theſe, for ſome time, us'd to go off without any Scar; but as her Strength decay'd, they became mortify'd.

Upon all the *Regio Epigaſtrica* the outward Integuments were very thin, little or no Fat being viſible: But from the upper Part of the *Regio Umbilicalis*, down to the *Os Pubis*, the Skin was almoſt half an Inch thick, of a whitiſh Colour, and hard, ſome of it appearing as if it were granulated, cauſed by ſome Obſtructions in the Miliary Cutaneous Glands.

The Fat under this Part of the Skin did exceed the Thickneſs of an Inch, being diſtinguiſh'd into ſeveral Lobules of an irregular Figure, and lodg'd in ſo many Cells adhering to the *Membrana Adipoſa*, which here alſo was much thicker than it uſually is in a natural State.

Her Thighs, Legs, and Feet were all *anaſarcous*, being extremely big and ſwell'd, eaſily retaining any Impreſſion made by the Fingers: And her Nurſe told me, that ſhe uſed to wet a great deal of Linen in drying up the Water, that would always iſſue out from theſe Parts, on the leaſt rubbing, yet all her ſuperior Parts were extremely lean and emaciated.

The fleſhy Part of the *Abdominal* Muſcles was much extenuated by the great Diſtention, yet their Tendons were as thick as uſual; and being very eaſily ſeparable from one another, I could plainly obſerve, that the Tendon of the *Obliquus Internus* adhered firmly to that of the *Tranſverſalis*, along the Edge of the *Muſculus Rectus*, and was not double, as *Realdus Columbus*, and all Anatomiſts after him, down to *Diemerbroek*, who was firſt aware of this Miſtake, have maintained: However, this ſtreight Muſcle derives the ſame Benefit from this Situation, being, as it were, hemm'd in one Side by this firm Adheſion; and on the other, by what they call the *Linea Alba*, as if it had indeed been incloſed between the two ſuppoſed Tendons of the *Obliquus Aſcendens*; that is, 'tis much ſtrengthen'd thereby in the time of acting. I obſerv'd alſo, that the Tendons of the two oblique Muſcles, and the fleſhy Part of the *Tranſverſalis*, between the Anterior Spine of the *Os Ilium* and the *Pubis*, near it's Commiſſure, did inſeparably join and unite with one another, forming as it were a thick and hard Border, from the Outſide of which, there was continued over the Blood-Veſſels, Nerves, and Muſcles, on the Fore-part of the Thigh, a large *Aponeuroſis*, which braced them down: The two *Laminæ* of the Membrane of the *Abdomen* being expanded on it's Inſide. Now this Border is what Authors call the *Ligamentum Pubis*, and what I have in another Place ſuppoſed to be the firm Union of the Tendons of theſe three *Abdominal* Muſcles with the *Peritonæum*.

Vid Myograph. comparat. Specim. pag. 5.

Having perforated the *Abdomen* in the moſt convenient depending Part, there iſſued out, with great Impetuoſity in a riſing Stream, a vaſt Quantity of ſlimy viſcid Water, in Colour and Conſiſtence very much reſembling a brown, thick, and ropy Syrup. This Water meaſured between 16 and 17 Gallons, beſides what was loſt on the Floor, and imbibed in Sponges and Linen made uſe of in drying it up.

When the Water was quite emptied, I fancied it had been all contained in a Duplicature of the *Peritonæum*, and had made a Dropſy in that Membrane, becauſe none of the *Viſcera* appeared; for in ſuch a Caſe I have more than once obſerved, that the inner *Lamella* of that Membrane of the *Abdomen* being ſeparated from the outer, is forced inward by the Weight of the Water upon the Bowels, to which it cloſely adheres, contracting the Guts and Meſentery into a very ſmall Volume. But upon a narrower View, I perceived that the thick Membrane including the Water, could be eaſily ſeparated from the *Viſcera*, having freed it from it's Adheſions by Membranous Filaments to the *Peritonæum*, and by Blood-Veſſels, to the *Omentum*. This Bag reached from the *Pubis* to the Midriff, and from the left Region of the Loins, to the Right; it filled up indeed the whole Cavity of the *Abdomen*, diſtending her Belly ſo far, that a Plate could eaſily lie upon it when ſhe was alive. Having gradually freed it from all the neighbouring Parts, and rolled it up, I found it adher'd inſeparably to the left *Tuba Fallopiana*, the Spermatick Veſſels being ramified upon it; and obſerving no *Ovarium*, which in the other Side was naturally diſpoſed, I concluded that the Bag was nothing but the Membrane of the *Ovarium* covering the *Ova* preternaturally thickened and diſtended by the Collection of the above-mention'd Humour, and that the Diſtemper was a true *Hydrops Ovarii*, inaſmuch as all this vaſt Quantity of Water was included in one Bag, being all of the ſame Colour and Conſiſtence.

All the other *Viſcera* in the *Abdomen* were ſound, and in their natural State.

In both Cavities of the Breaſt there was contain'd a great Quantity of reddiſh Water.

The Liquor in the *Pericardium* was very abundant, and of a greeniſh Hue.

The right Lobe of the *Lungs* was tied to the Membrane of the *Thorax*, covering the upper Part of that Cavity, but the left was free from any Adheſion.

In the *left Ventricle* I found a large *Polypus*, or Serous Concretion, of a round Figure, a white Colour, and of a pretty hard Conſiſtence, with ſeveral long Roots of a red Colour, which extended thro' the Auricle and Bulb of the *Pulmonary Vein* into it's neareſt Divarications in the Lungs.

Having carried home this large *Bag*, with the *Uterus* appendant, cut off, below the Orifice of the *Meatus Urinarius*, and viewed it at Leiſure, I obſerved,

That the right *Spermatic* Vein, which opens into the *Cava* a little below the *Emulgent*, was three times larger than the left; and from a little above the *Ovarium* it was continued, without any Diviſion, to it's Termination.

The right *Ovarium* was in a very natural State. The *Cicatrix* or *Caruncula*, whence the fœcundated *Ovulum* had dropt, was yet remaining, and the Blood-Veſſels were ramified upon this *Teſtis* in a very beautiful Manner.

The *Tuba Fallopiana*, with it's *Fimbriæ*, were all well diſpoſed.

The Diameter of the left *Spermatic* Vein, which opens into the *Emulgent* of that Side, was much leſs than ordinary. And from the extraordinary Narrowneſs of the Bore of this Veſſel, we may draw a not very improbable Reaſon of ſome Cauſe of this Watery Swelling; for the Blood being hereby hindered in it's Reflux to the Heart, a great deal of *Serum* or *Lympha*, thro' it's ſlow Return, muſt needs be thrown off upon the *Ovarium*, already indiſpoſed, whence the gradual Increaſe of the Tumour did proceed.

The two *Spermatic* Arteries were contorted, and full of Turnings and Windings, from their meeting with the Veins to the *Ovaria* and *Tubæ*.

A little below the *Kidneys* each Artery ſent out a Branch, which was loſt on the *Peritonæum* and fatty Membrane of the Kidney: And from the ſame Places the Veins received two conſiderable Branches.

One of the Arteries went off by a narrow Orifice from the Side of the *Aorta*, the other roſe up from it's Middle, a little below the firſt.

Between the *Bag* and the *Uterus*, all theſe Veſſels were much dilated, making ſeveral Turnings and Circumvolutions upon the *Peritonæum*, called in this Place *Ligamentum Latum Uteri*.

The left *Tuba Fallopiana* was only remarkable in it's being much longer and larger than uſual.

In the *Bag*, which was nothing but the Membrane called *Dartos*, which covers all the *Veſicular* Glands of which the *Ovarium* is compos'd, I obſerv'd ſeveral little Bladders of different Sizes, diſtinct from one another, which contained a limpid or clear ſlimy *Serum*, in Colour and Conſiſtence like a Mucilage of the *Semen Cydoniorum*; theſe were either *Hydatidal* Tumours only, or the Eggs themſelves diſtended. This Liquor hardened by a ſlow Heat into the Conſiſtence and Colour of the White of an Egg.

All the *Fundus Uteri* was about an Inch and a half thick, but near the *Collum minus* it grew ſomething thinner, which did proceed from the Diſtention of it's Spongy and *Veſicular* Subſtance, by the Blood in the Veſſels running thro' it in Variety of Turnings and Windings; ſo that when it was cut, it very much reſembled the Subſtance of the Lungs.

Upon the inner Membrane of the *Uterus* I obſerved, upon wiping it with a Sponge, ſeveral little Eminencies, which I took to be the Glands mentioned by *Malpighius*, which ſeparate a Humour, to lubricate and moiſten it's Cavity.

On the upper Part of the *Fundus Uteri*, I took Notice of a great Number of ſmall Veſſels, like ſlender Filaments or Threads, running off from it'sMembrane, and terminating into a reddiſh and ſoft ſpungy Sort of Subſtance, not unlike the *Uvula*, bating it's Colour, which hung down from that Side of the Womb in Form of a Nipple. Theſe perhaps are the Veſſels, which in the Opinion of ſome, do ſeparate and excern the Matter of the *Lochia* and the *Menſes*, they being only viſible at thoſe Times.

Near the Beginning of the *Tubes*, I perceived two *Tubercles*, or little Bunchings, about the Bigneſs of a Nut, to which perhaps the *Placenta* was faſtened, and to theſe adhered ſeveral Glandules of a blackiſh Colour, of different Sizes.

The *Collum minus* was compoſed as it were, of two *Labia*; the uppermoſt was moſt protuberating, and upon it I obſerved ſeveral ſmall Glands, out of which, upon Compreſſion iſſued a viſcid clear Liquor, which is ſaid to ſeal and cloſe up this Part, in time of Pregnancy. The lower *Labium* was longer and thinner, it's Edges being cut or indented in ſeveral Places.

The *Rugæ* in the lower Part of the *Vagina* run as they are repreſented in Books; but thoſe in the upper Part had a quite different Fig. 160. Courſe, as they are exactly delineated in the Figure.

Near the Orifice of the *Meatus Urinarius*, there were obſervable two very large Caruncles, in ſhape like a Mulberry.

As far as I was informed, the Symptons that accompanied her big Belly, were, that,

About three Years ago, not long after ſhe had lain-in of her firſt Child ſhe had a violent Blow upon the left Side of her Belly, very painful for the preſent, but in two or three Days, upon keeping herſelf quiet in Bed, the Pain and Anguiſh went off. About two Months after this, ſhe began to feel ſome ſmall Pains in the left *Hypogaſtric* Region, where ſhe had lately received the Blow; and ſhe obſerved that Side of her Belly to grow abundantly bigger than the other: Theſe Pains increaſed more and more, till they grew very violent, but upon Conception, which was three Months after ſhe was firſt afflicted with them, they went off, and her Belly ſwelled gradually, as is uſual in Pregnancy, having no other Symptoms but what are incident to that State, only ſhe was much bigger than ordinary; and on that account ſhe forbore the Uſe of Medicines, which poſſibly might have been effectual in her beginning Diſtemper.

After Delivery, the Swelling and Bulk of her Belly continued much the ſame as before the Birth; only, upon a plentiful Evacuation of the *Lochia*, it decreaſed a little. When her Month was up, ſhe adviſed with ſeveral Phyſicians, Apothecaries, &c. who uſed *Emeticks*, ſtrong *Cathartichs*, *Diuretick* Diet-drinks, and all the Train of Medicines commonly uſed in a *Dropſy*, her ſuppoſed Caſe. All the Effect they had, was to prevent the farther Increaſe of the Swelling, while ſhe uſed them; but, being weary, ſhe left them wholly off, and then the Tumor increaſed very remarkably.

Thus ſhe continued about one Year, and then ſhe conceived again, which ſhe ſuſpected, by the Stoppage of her *Catamenia*, having always been very regular but at ſuch a time. Her Stomach was always good; ſhe never was very thirſty, ſo drank but little; made Water freely and in great Quantity, and was attended with none of the Symptoms of an *Aſcites*, except the Swelling of her Belly; only when ſhe was half-gone, her Legs began to ſwell and pit, growing very big all of a ſudden: from theſe, and likewiſe from her Belly, there would often iſſue out a great deal of watery Humour, upon rubbing, eſpecially if ſhe ſcratched the little Pimples that would often ariſe in theſe Parts. About this time ſhe began to be afflicted with a Difficulty in Breathing, with a violent Trembling and Palpitation of her Heart, and to be often ſubject to great and involuntary Sighings. She was not able to lie down, but was ſtill obliged to ſleep in a ſitting Poſture, for fear of being choaked. I think it probable, that all thoſe Symptoms did proceed from the Deluge of Water contained in the Cavities of the *Thorax* and the *Pericardium*; which, no doubt, did more effectually haſten her End, than the Bigneſs of her Belly, with which ſhe might have lived ſeveral Years.

After ſhe was brought-to-bed of a live Child, ſhe became exceeding weak, being unable to fetch her Breath, and complained much of a heavy Load and Oppreſſion on her Breaſt; and the third Day ſhe expired.

Fig. 159. *repreſents the* Glandulæ Renales, *the* Uterus, *with the* Fig. 159.
Parts belonging to it, and the large Bag *or* Membrane *of the* Ovarium *preternaturally* diſtended.

a, *The* Glandula Renalis *on the right Side.* B, *An* Eminence, *or Riſing in it's Middle.* c, *A* Vein *that runs from it to the* Cava. d, *The* Glandula Renalis *on the left Side.* e, *A Sulcus or Furrow in it's Middle.* f, *A Vein running from it to the Emulgent.* g, *A ſmall Vein that comes from the Diaphragm, and opens into this Vein before it leaves the Gland.* h, h, *Two ſmall Arteries from the* Aorta. i, i, *Two Nervous Twigs from one of the Intercoſtal* Plexus's. A, A, *The Kidneys.* B, B, *The* Uterus *cut off.* C, *The* Cava *cut off.* D, *It's Diviſion into the* Rami Iliaci. E, E, *The Internal Branches into which the Hypogaſtricks open.* F, F, *The Emulgent Veins.* G, *The* Aorta *cut off.* H, *It's Diviſion into the Iliacs.* I, I, *It's Internal Branches, which are ſpread upon the* Uterus. K, K, *The external Iliacs of both Veſſels.* L, L, *The Emulgent Arteries.* M, M, *The Spermatick Veins.* N, N, N, N, *The Spermatick Arteries, very much contorted in their Progreſs, that on the right Side being cut off.* O, *The* Union *of the* Branches *of the* Spermatick *Vein on the right Side.* P, *The right* Ovarium, *with Blood-Veſſels ramified on it's outer Membrane.* Q, *The right* Tube. q, *It's* Fimbria. R, *The* Tube *on the left Side, it's* Fimbria *adhering to the large Bag.* S, S, S, *The* Membrane *of the left* Ovarium, *diſtended to a vaſt Bigneſs, with the Blood-Veſſels ramified upon it.* T, *Some of the* Ovula *grown big.* W, *Some* Hydatidal *Tumours on the Inſide of the Great* Bag.

VVV, *The* Ligamenta lata. U, *The* Fundus Uteri. X, X, *The* Ligamenta Rotunda; *the Membrane that covers them, being laid open, that the Veſſels of which they are compoſed may be viewed.* Y, *The* Vagina *cut off.* Z, *The* Veſica Urinaria. * * *A ſmall* Artery *and* Vein *on each Side, the firſt going off from the* Spermatick, *is ſpread upon the* Membrana Adipoſa *and* Peritonæum *under the* Kidney; *the latter bringing back the Blood from theſe Parts, opens into the* Spermatick *Vein.*

Fig. 160. Fig. 160. *Shews the* Vagina *and* Uterus *cut open.*

A, A, A, *The* Fundus Uteri *laid open, and it's Sides folded back.* 1, 1, 1, 1, *The inner* Spongy Subſtance, *with the Orifices of the* Hyſterick *Veſſels.* 2, 2, *The* Glands *appearing on the* Inner Membrane *of the* Uterus. 3, 3, *The ſmall* Veſſels, *by which the* Lochia, *&c. are ſeparated.* 4, *A ſoft* Subſtance, *depending from the upper part of the* Uterus, *into which the foreſaid* Veſſels *terminate.* 5, *Two* Tubercles, *ſeated near the Beginnings of the* Tubæ, *to which the* Placenta *adhered.* B, B, *The* Vagina *laid open.* 6, 6, *The two* Labia *of the* Collum minus. 7, 7, *Several ſmall* Glands *placed on the Upper* Labium. 8, *The Courſe of the* Rugæ *on the Upper-ſide of the* Vagina. 9, 9, *Their* Direction *on the Under-ſide of that Part.* 10, 10, *Two* Orbicular *Subſtances, near the* Orifice *of the* Meatus Urinarius.

Balls of Hair *taken from the* Uterus, *and* Ovaria *of Women by Mr* J. Yonge, n.309. 2327.

XXXI. In *November* 1705, I was called to deliver a Woman 30 Years old, who had four Days laboured in vain to bring forth her firſt Child: The Head being too big for the Paſſage, ſtuck immoveable at the *Os Pubis*; ſo that I could neither faſten a Crotchet, nor draw it out by a Cupping-glaſs fixed to the Scalp with an Air-pump.

In this Extremity I directed my Son to open the Child's Head, and take out all the Brains, with ſo much of the Skull as he could; and then by a Cord faſtened round the Neck with a Nooſe, to pull it out, which was ſoon and eaſily done.

The Child was corrupted and ſtunk much, ſo did the *Lochia*, which flowed three Weeks; ſoon after they ceaſed, the *Menſtrua* appeared, and the Woman went abroad: About ſix Weeks after her Delivery, ſhe was ſeized with violent Convulſions and Hyſterick Fits, which laſted near three Days; when a painful Tumour aroſe in the left Side of her Belly, which ended in an Eruption of white thick Matter near a Pint, with ſmall Knobs of a Subſtance like the Yolk of boiled Eggs: All Symptoms immediately vaniſhed, only ſhe complained of the great Hollowneſs where the Tumour had been.

Four Days after this, the like Swelling appeared on the right Side of her Belly, which continued with a ſmall Flux of Matter about five or ſix Months, in ſpite of Remedies.

About that time there appeared in the *Pudenda* a Bunch of ſomething like greaſy Wool, which being drawn forth, proved a Ball or Wad of *Hair*, the Bigneſs of a Turkey's Egg, immerſed in an unctuous Slime, adhering on one Side to a Membrane ſo large as the Palm of a

Man's Hand; and in the midſt of it a ſmall pyramidal Bone reſembling a ſplit Tooth. The Tumour ſank upon this, and the Fluor ceaſed immediately; and her Lunary Flux (which all this while had not appeared) flow'd as uſual, and ſhe continueth in perfect Health ever ſince, full nine Months.

The Bone is perfectly ſuch; ſo is the Hair, being fine, ſoft, and indifferently ſtrong, of no great length, of a light-brown Colour, entangled like a Parcel of Combings.

This Caſe, tho' rare and extraordinary, hath ſometimes happened to others. Dr *Tyſon* tells us, That in *November* 1679 he diſſected a young Gentlewoman, and found the right Teſticle, or *Ovarium*, ſwoln into two Bags, almoſt as big as a Man's Head, full of a pale *Serum*, in which floated ſeveral Lumps of a ſoft fat Matter, which diſſolved in part when put into hot Water. One of thoſe Pieces was half as big as a Man's Fiſt, in which lay a great deal of Hair (as there did, tho' not ſo plentifully, in all the reſt) of a Silver Colour, ſoft, fine, ſtrong, and above two Foot along; it was not faſtened to, nor ſeemed to grow from any Part, but lay entangled in this Matter, and in it a bony Subſtance exactly reſembling that which is commonly called the Eye or Dog-Tooth. Vid. Supra, Vol.III. p.15.

Another time, diſſecting a Woman forty Years old, he found, near the *Uterus*, a Bag as big as a large Turkey-Egg, and in it a fatty Subſtance like that abovementioned, with a great Quantity of light ſoft Hair faſtened to a fleſhy Subſtance: Within this *Cyſtis* a Bone, in ſome ſort reſembling a Mandible, having ſeveral Sockets, in which were ſeated three *Dentes Molares*, or Grinder-Teeth, and a fourth not quite grown out.

Dr *Grew* tells us, That in your *Muſæum* lieth ſuch another Tooth, found by Dr *Tyſon*, after the ſame manner. And the Doctor himſelf tells us, That Dr *Needham* found a Tooth and Hair in the *Ovarium* of a dead Woman. And Dr *R. Hook* ſays, That Dr *Samſon* found the like in two great Globoſe Tumours depending on, or rather Parts of the extended *Ovarium*, wrapp'd up in diſſolvable and inflammable Fat, of a yellow Colour. *Muſ.* R. S. *p.* 15.

About ten Years ſince, Sir *Andrew Leak* gave me a ſmall Bunch of Hair, being part of what had been found in the Belly of a young Woman at *Deal*, by Mr *Joſ. Nichols* a Surgeon there. The Caſe was this:

A. D. 1696, a Virgin of Thirty fell into a Periodical Fever, and afterward a total Suppreſſion of her *Menſtrua*; which was ſoon followed with a Pain and Tumour in the right Side of her Belly, which grew and increaſed, maugre all the Remedies adviſed by the neighbouring Phyſicians, 'till it became bigger and harder than that of a Woman in her laſt Month. When it had grown a full Year, it began to ſoften; and then the People who ſuſpected her Honeſty, thought her in a Dropſy. At fifteen Months end the Belly was ſo diſtended, that it ſeemed ready to burſt; which made the Patient deſire the Phyſicians to adviſe Mr *Nichols* to make the *Paracenteſis*: But all were ſurprized, when, inſtead of Water, there ruſhed out a Pint and a half of ſweet, well-digeſted Matter. The next Day he let out as much more, and then perceived Hair four or five Inches long iſſue forth with the Matter, but ſo faſtened in the Inſide, that he could not pull them out, the Woman complaining he would draw out a Piece of her Belly.

She lived but four Days after the Operation; and on Diſſection of her Belly there was found ten Quarts of the ſame Matter, which flow'd through the Tap-hole, and in it floating a Lump of Hair as big as an Halfpenny Loaf, wrapped up in a fatty Matter; from which being cleanſed, it weighed full half an Ounce. On the right Side of the Womb he found a Protuberance bigger than a large Wall-nut, from which the Hair grew eight Inches long: That Tumour, or rather the *Ovary*, being ſeparated from the *Matrix*, there was found in it a perfect Dog-Tooth ſocketed in a Bone of a triangular Figure, in which another Tooth was growing; the Bone had a *Perioſtium* on it, ſurrounded with Fleſh, faſtened at the *Calvaria* to the Skull.

My Patient's Caſe hath two Difficulties in it, which I cannot get over, *viz.* How theſe Subſtances got in where they lodged? And how they got out thence by the Way they did? Without doubt they were neſted in or near the Teſticle, the Place of Tumour and Pain; and the many Anatomical Diſcoveries made by thoſe I have quoted, do even demonſtrate it: They could not be conveyed into that Bowel, and muſt therefore be made in it; and of what Materials, is the Queſtion. Such who call theſe extraordinary Appearances *Luſus Naturæ*, ſeem like thoſe of old, who, wearied in their Natural Searches by ſome puzzling Difficulty, take Refuge in Words, aſcribing the Cauſe of Things which they cannot diſcover or diſcern, to occult Qualities, &c.

If by it they mean, that Nature being on the Work of Generation, miſtook, failed, or was diſappointed, and inſtead of forming an *Embryo* or *Fœtus*, made a *Chaos*, turned into a confuſed Lump of Bone, Fat, Hair, and Membranes, the Materials or Elements of Animal Bodies; they greatly err: For in all ſuch Acts of Nature, the Coition of both Sexes is required, according to the old, or either of the new *Hypotheſes* of Generation, which in the Girl of *Deal* was wanting; ſhe being found, upon a very nice and ſtrict Scrutiny, to die a Virgin, and intact.

We are told by many Authors of Credit, That great Quantities of Hair have been found in all the Parts of Human Bodies, the Fluids not excepted. Dr *Tyſon* has publiſhed a large Collection from them, and has given us ſome Thoughts, and Conjectures, concerning their Origin and Production.

This is the only Difficulty all thoſe Stories I have told from others are incumbred with; but mine hath another no leſs hard to reſolve. It is obvious how thoſe Things were got out of the Women that died;

but my Patient who ſurvived the Evacuation, puzzles me to find the *Ductus per Quem* for ſuch Lump to paſs from without the Womb into the *Vulva.* It was certainly lodg'd without the *Uterus* : But which way could ſuch a Lump of greaſy Hair, with a Bone, and a large Membrane adhering, paſs into it? I know none but the *Tuba Fallopiana* ; but the Orifice of that into the Womb is is ſo ſmall, that it somewon't admit an Egg no bigger than a Corn of Pepper to paſs ; whence thoſe Conceptions, which are made in that Trunk, are occaſioned. It will diſtend very largely, ſo as to hold a big *Fœtus* ; but where it is inſerted to the Matrix, the *Foramen* is too narrow for Subſtances of ſuch Magnitude to *paſs*, unleſs ſome very extraordinary Accident expanded it ; and what that can be, I cannot apprehend.

An Account of a Woman diſſected *ſoon after* Delivery ; *by Dr* P. Silveſtre. *n.* 269. *p.* 787.

XXXII. Mrs *Duchesne* about forty Years of Age, plethorick, and frequently ſubject to the *Menſtrua*, even during the Time of Pregnancy, but otherwiſe very healthy and pretty fat, and now with Child for the twentieth Time ; after ſhe had gone the full Time, ſhe was ſeized with a violent flooding from the Womb, about four o'Clock in the Afternoon, *Nov.* 12, 1697. *Jacob Arnaudin*, being called to her about nine in the Evening, and told of the violent flooding ſhe laboured under, he imagined the only Remedy was to deliver her as quickly as poſſible : But the By-ſtanders, as commonly happens, called out to him not to be raſh, but to leave the whole to Nature. At laſt her Strength being thereby quite exhauſted, Monſ. *Arnaudin* was again called about the Middle of the Night, and, falling immediately to work, delivered her in half an Hour of a dead Girl, the Secundines coming after entire without any Labour. The flooding however ſtill continued, and was attended with great Reſtleſſneſs, a weak Pulſe, frequent Faintings, cold Sweats, and Convulſions. At laſt, about ſix o'Clock in the Morning, ſhe died.

We opened her next Day, and having laid open the Abdomen, and removed the Omentum, which was very fat, together with the ſmall Guts, the Uterus appeared like a large Cupping-glaſs, thick, and pretty much diſtended. In the broad Ligament of the right Side, there was a large Ecchymoſis, which deſcended from the Side of the Uterus, at that Part where the *Spermatick* and *Hypogaſtrick* Veſſels are joined by Anaſtomoſis, and was moſt conſpicuous in the lower Part of the Neck of the Womb, where it lies upon the Rectum. We cut out he Womb with the Parts belonging to it, and laid them upon a Table. The *Vagina* was very lax, and it's internal Orifice ſo open, as aſily to admit half one's Fiſt. Having laid open the Womb according to it's Length, we obſerved the following : In the Bottom of it ſome Clots of grumous Blood, otherwiſe it was quite ſound and entire : In this Part however the Adheſion of the *Placenta* was very conpicuous ; and there likewiſe it's internal Subſtance was unequal, more thick and fleſhy than elſewhere. In the lower Part of the Neck of the

Uterus, the Cauſe of her Death appeared, *viz.* a Laceration capable of admitting two Fingers, which could likewiſe be ſeen externally, where the Ecchymoſis appeared. Whether the Womb was torn from ſome external Accident, or rather from the violent kicking of the Child, as the Writers of Medical Obſervations mention ſometimes to have happened, I cannot determine. But it is certain, that thereby the large Veſſels were opened, which poured out that enormous Quantity of Blood. The Coats being divided, and a Blow-pipe introduced between the Doublings of them, the Air blown in burſt out every where by a great many ſmall Orifices, both from that Part of the Fundus to which the *Placenta* was connected, but eſpecially from the Part of the Neck that was lacerated.

In the right *Ovarium* I very plainly obſerved the Mark or ſmall Cicatrix, through which I make no doubt the little *Egg* had dropped and was received into the Cavity of the *Tuba Euſtachiana*, and by it's periſtaltick Motion conveyed into the Uterus. The left *Ovarium* was flaccid, and as it were withered. The *Tube* on each Side was opened, the *round Ligaments* very ſtrong, and all the other Parts appeared to be quite ſound.

Although the Womb is very ſoon ſtraightened and contracted after Child-bearing, ſo that in this Woman, who died in about ſix Hours after ſhe was delivered, it ſcarce exceeded the Size of a large Cupping-Glaſs; yet I could eaſily diſtend it with my Finger like a Purſe or Bag. And every Body muſt ſee, that the fleſhy Fibres which are ſo gradually ſtretched in Time of Pregnancy, and ſeparated at ſuch a Diſtance from one another, muſt require ſome Time to recover their former Tone and Strength.

I ſhall here obſerve by the bye, that that Queſtion is very trifling which is here commonly propoſed, viz. *Whether the Coats of the Womb are a great deal thicker in pregnant Women, than in thoſe that are not impregnated?* I own indeed that the Subſtance of the Womb in thoſe that are not impregnated, is firmer, more compact, and likewiſe more thick, becauſe it's fleſhy Fibres at that time are ſhort and very much contracted: But in Women with Child, which was viſible here to the naked Eye, the Womb is much more lax, upon account of it's Fibres being diſtended, and ſeparated at a greater Diſtance from one another. Beſides as the Blood-Veſſels, whoſe winding and as it were ſerpentine Ramifications, reſembling the Tendrels of Vines, in a natural State, creep upon the Bottom and Sides of the Womb, in pregnant Women are extended with the Uterus, and ſeparated from one another; hence it is that theſe Coats appear ſlenderer and leſs thick. But what happens to the Stomach, the Bladder, and other membranous Parts of the Body, which become a great deal thinner by being diſtended; why the ſame Thing does not happen likewiſe to the Uterus, the Cauſe is very evident; for in the ſame Proportion as the Coats are diſtended, the Veſſels of every Kind which run very thick upon them are dilated for the Nouriſhment and Growth of the *Fœtus*. Beſides, the internal Surface of the Womb being perforated with a great many proper Ducts, becomes thicker at that Time, eſpecially at it's Fundus where the *Placenta* adheres to it; which is likewiſe very plain in Animals which have the *Cotyledons*. But the Occaſion of this Miſtake, I imagine to be owing to ſome Anatomiſts having opened Bodies ſoon after Delivery, at which Time the Womb is immediately contracted, and it's Veſſels being ſtill varicous and diſtended with Blood, this might eaſily impoſe upon them, ſo as to make them believe that the Coats of the Womb in the Time of Pregnancy, are twice as thick as they are naturally in an unimpregnated State.

It is worth while to obſerve that ſingular Diſtribution of the Blood-Veſſels, which I hinted at above, upon the Coats of the Uterus, *viz.* the Spermatick and Hypogaſtrick Arteries and Veins, which are elegantly twiſted, like the Tendrils of Vines, both in the Bottom, and upon the Sides of the Womb. And hence they not only allow themſelves to be extended in proportion as the Bulk of the Womb increaſes, but in the laſt Months of Geſtation, being ſtretched nearer to ſtreight Lines, they allow the Blood to paſs more readily through them, and conſequently to be diſtributed in greater Plenty to the Womb. But how much that muſt contribute towards ſupplying a greater Quantity of Nouriſhment to the *Fœtus*, which is now conſiderably increaſed in it's Bulk, it would be altogether ſuperfluous to explain in this Place.

An Account of the greateſt Part *of a* Fœtus *voided by the* Navel; *by Mr* C. Birbeck. *n.*275.*p.*1000.

XXXIII. The Wife of one *Raper* at *Coxwold*, 12 Miles from *York*, falling in Labour, the Midwife uſing her Endeavour, extracted the Secundine, it offering itſelf firſt, and could not by her beſt Skill perceive any thing elſe remaining. The Woman's Body falling, and for ſome Days ſhe being pretty eaſy, and the Womb being contracted, the Midwife took this Secundine for a *Mola* or falſe Conception; but in about a Week more ſhe began to diſcharge plenty of *Fœtid* Matter by the *Vagina*, which continued, and in Proceſs of Time ſhe felt a troubleſome Hardneſs on the *Hypogaſtrium*, which increaſed daily for above ſix Weeks, by which the Woman was brought ſo low, that they deſpaired of her Life. This Lump, Hardneſs, and Soreneſs, wrought upwards to the *Regio Umbilicalis*; and I ſuppoſed continued there fixed for about a Month; at length being exceeding painful, the neigbouring Gentlewomen took it for a great Boil or Apoſtume, and applied what they uſually do in ſuch Caſes, to aſſiſt it's Suppuration and Breaking, which had it's Effect, and it broke upon (or rather under) the Navel, diſcharged then (and afterwards) a great Quantity of a thin, fœtid, and diſcoloured Liquor. The Part about it mortified, and the Ulcer inlarged to that Bigneſs, that a Man's Hand might be introduced therein; it continued exceeding painful, and emitted ſuch an exceeding Stench, that no one could endure to look on it, a ſmall time after they found ſome little Bones wrought out of it, at which they were amazed, and ſhewed them to me; I found them to be the Bones of a Child's Finger, upon which I went to ſee her. When I examined it, I perceived the Fœtus in a confuſed Heap, or mortified Lump, for with my Probe I felt ſeveral Bones, and at that time extracted (after I had ſeparated and dilated the Mortification about it) above half the Ribs, ſome *Vertebra's* of the Back and other Bones, and cut out above a Pound of the Child's mortified Subſtance, as black as Ink, with an extream nauſeous Smell; and every 2d or 3d Day for a Month, I extracted what I could, being forced to do it very deliberately, by reaſon of the exceeding Weakneſs of the Woman, who had certainly died in the Operation, had I forcibly extracted it, and not given her time; for we were obliged every Moment to ſupport her with Cordials, and after every Operation ſhe found herſelf lightſomer, and by Degrees ſweeter, which gave me Hopes of her Recovery. For not only the *Linea Alba* and Muſcles of the *Abdomen*, but the *Peritonæum* and *Omentum* were mortified to a great Breadth, and the Inteſtines lay fairly in View, and expoſed to the Air a long time. When I had extracted Part, and had a plentiful Diſcharge of thin fœtid Matter, the other Diſcharge downwards began to leſſen and abate, ſo that I endeavoured to aſſiſt it by Bandage and Compreſſes, with deterging and drying Injections up the *Vagina*, by which means in a little time I had no diſcharge that way, and thoſe Parts became ſhortly perfectly well, and in ſome time after the Ulcer ſeparated (with the Aſſiſtance of Fomentations, good Digeſtives and Mundificatives) from it's Putrifaction, contracted and united wonderfully, and hath now been quite cicatrized near three Months, all the whole *Abdomen* being ſoft, eaſy and well conditioned: The Woman laboured all this Seaſon at Hay and Harveſt.

I preſume by the forcible Extraction of the Secundine, the *Uterus* had been lacerated and ſo ulcerated; the Woman being extremely weak, and conſtantly lying in Bed, gave the more Liberty for it's working upwards.

Of the Bones *of a* Fœtus *voided through an* Impoſthume *in the* Groin; *by Sir* P. Skippon, *n.* 302. *p.* 2077.

XXXIV. I lately viſited a Woman 66 Years old, in *Drury-Lane*, who had a Child conſumed in her *Uterus* about 28 Years ago; ſhe bore two Children after this, one whereof liv'd 11 Years, and the other 6. About 8 Years ago, an *Impoſthume* broke out in the right *Inguen*, and then ſeveral Bones of a dead Child were expelled (ſome of them I have by me). She has a great Swelling now in that *Groin*, where ſhe feels ſomething very hard, which ſhe ſuſpects are Bones.

An Account of ſome Extra-Uterine Fœtus's, *by Mr* J. Yonge, *n.* 323. *p.* 426.

XXXV. The following Account was communicated to me in theſe Words—— “I ſend this to acquaint you with a ſtrange Occurrence ob- “ſerved laſt Week: A Gentleman's Servant having killed an Ewe, “which was thought fat, and taken out the Bowels, found a very unu-

"ſual and monſtrous Lump of Fat, proceeding like a Wen from the " middle of the *Omentum.* I was called to ſee it, and having cut it " open, found incloſed a Lamb of the ſame Parts, Features and Dimen-" ſions with others of that kind. How it came there, and how nou-" riſhed, are Queſtions I would have reſolved."

Having thirty Years ſince been ſhewn the like, found in a Bitch, by a Chirurgeon in *Oxford*, I told that Gentlewoman, that that Lamb was not conceived in the Womb, but in one of the *Fallopian Tubes*; wherein growing too big to be contained, it either broke out into the Place where it was found, or ſlipped back toward the upper Orifice, and thorough it into the Belly: That afterward, aſſiſted by the prone and inclining Poſture of the Sheep's Body, it ſlipped forward to the *Omentum*, and was there nouriſhed the uſual way, *viz.* by the *Placenta*, which was doubtleſs fixed in the *Tube*, and the *Pedunculus* being kept whole, will eaſily extend from thence to the *Fœtus*, where it lay.

Had this Sheep been nicely diſſected, I verily believe we ſhould have found my Opinion true in Fact. *Riolan.* Jun. *Anthropog. Nov.* lib. 2. c. 34. was the firſt that obſerved theſe ſtrange Conceptions; and he tells us they have the Coats, Secundine, *&c.* of ſuch *Fœtus*'s as are engendered within the Womb. And conſidering the late Anatomical Diſcoveries, and new Hypotheſis of the Genital Parts in Women, and their Uſes in Generation, made by *Theod. Kerkringius*, *de Graaf*, and others; it ſeems more than probable, that ſuch Conceptions as we are ſpeaking of, happen when in Coition one of the Eggs deſcends into the Tube; and being unable to paſs into the *Uterus* through the lower Orifice (which is ſometimes, and in aged People always, contracted); and being however impregnated by the *Aura Seminalis*, or * *Animalcula*, wherewith the Teſticles and ſeminal Parts of ſome Males do ſo prodigiouſly and incredibly abound; it there grows, till too big to be contained, and then breaks forth into the Belly: Though ſometimes, as I ſhall ſhew, they continue in the Tube itſelf. There the *Placenta* fixes, and ſucks Nouriſhment as from the *Fundus Uteri*; and if the *Pedunculus* holds together, conveys it to the *Fœtus*, as it doth to thoſe in the natural Place of breeding.

Such *Extra-uterine Embryo*'s have been ſometimes found in Women; but not publickly taken Notice of till the Beginning of the laſt Century; the younger *Riolan* ſpeaking of the *Fallopian Tubes*, ſays, They appear of the ſame Nature and Subſtance as the Womb, *Quia carnoſa eſt, in quâ, quod eſt mirabile, fœtum humanum concipi fuit obſervatum.* Then gives an Account of four ſuch ſtrange Conceptions which occurred to his Knowledge.

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* *Mr* Leeuenhoek *ſaith, The Milt of a Codfiſh hath more* Animalcula, *than there are People on the Earth. Dr* Hook Phil. Collect. *No.* 1.

Since which Time, more ſtrange ones have happened in that Country. One was found at *Paris*, *January* 1669, by Mr *B. Veſal*, in the right Tube of a Woman. It was four Months old, and ſo grown, and the Tube ſo diſtended, as made him miſtake it for another Womb, and accordingly to call the Account he publiſhed thereof, *Demonſtration d'une double Matrice.* Mr *Oldenburgh* put an Extract of it into the *Philoſophical Tranſactions*, No. 48. and the *German Academy*, Vol. I. Obſ. 110. did the like: But neither ſeemed to underſtand the Myſtery, 'till *de Graaf* took it right, and made uſe of this very Obſervation to illuſtrate and confirm the Hypotheſis of *Kerkringius.* And ſoon after *Elſholtius* did the ſame, in a little but curious Tract, *De conceptione Tubaria, qua Humani Fœtus extra Uteri cavitatem in tubis quandoque concipiuntur.* He recites the Story as from Mr *Veſal*, and gives the Figure of the ſuppoſed two Wombs, and the *Fœtus* in the diſtended Tube; and among other ſuch Conceptions, mentions two large *Mola*'s found without the *Matrix* of one Woman.

About ten Years afterward, a much more wonderful and incredible one happened there. It comes very well atteſted by Mr *Bayle*, who firſt publiſhed an Hiſtory of it in the *Journal des Sçavans*, A. D. 1678.

Soon after Mr *Nic. Blegny* did the ſame with Figures. And afterward Mr *Oldenburgh* put an Extract of it into the *Philoſophical Tranſactions*, No. 139.

'A Woman, *A. D.* 1652, came to her full Time of Bearing, but 'altho' ſhe had all the Symptoms uſual at that Seaſon, no Child came. 'She continued in that Condition twenty Years, ſtill feeling the Child 'within her. From that Time ſhe felt not any Motion it had. In '*June* 1708, ſhe died, and the next Day was opened. In her Belly 'without the Womb, a dead Child was found lapped up in the *Omentum*: it weighed eight Pounds; and although it was kept in that hot 'Seaſon three Days out of the Mother's Belly, it did not ſtink.' Mr *Blegny* was curious to inſpect, and give a particular Account of this wonderful Thing to the World, not only in the Tract abovementioned, but alſo in the firſt Volume of his *Zodiacus Medicus*, Obſ. 9. with very remarkable and learned Animadverſions.

Before either of theſe appeared in *France*, there happened one in *Holland* to *H. Rhoonhuys.* 'A Woman with Child, at her full Time, 'was four Days in Labour, and although ſhe had ſo many Midwives, 'could not be delivered. Our author was called, *December* 1658, 'found the *Internum Uteri Oſculum* cloſe ſhut: Without Flowings, 'or other Fore-runners of the Delivery. He finding the common 'Paſſage ſo cloſely ſhut up, and a very painful Tumour above the 'Navel, propoſed the *Cæſarean* Section. The Woman having ſeen 'that Operation made at *Paris*, earneſtly deſired him to perform it on 'her. But he, to obſerve ſome unneceſſary Forms, delayed it till the Woman was paſt Life: Who he believes might with the Child have been 'preſerved, if the Operation had been done when he firſt ſaw her.

Opening the Belly after Death, he found a Child amidſt the Entrails; and, as he ſaith, the *Placenta* faſtened to the *Colon*, and part to the *Fundus Uteri*; and that there was a Breach in the Womb capacious enough for the Infant to paſs through it into the Belly; and that Wound, he thinks, was made by a Blow, although it hurt not the external Parts, nor made Impreſſions on the tender *Embryo*. I cannot approve, nor will I cenſure the many Things in his Report liable to Exception: I preſume, he miſtook the extended Tube for a *Matrix*, as *Veſal* did.

T. Bartbolinus, the Year after *Rhoonbuyſe*'s *Exploration*, met with ſuch an extraneous *Fætus* wrapped up in a *Mola*, which he found in the Belly of a Woman; and thus conjectures: —— *Non poſſum aliud divinare, quam quod fætus bic primo fuerit in Tubis uteri conceptus*. He imparted this Story firſt to *G. Horſtius, Ep.* 58. *Vol.* 4. Afterward in the 92d Obſervation of his *Sixth Century*.

A. D. 1662, in the City of *Aurange*, *D. Baldwin* and Monſ. *De la Fort* found—— *Puellum Egregium, optime formatum extra uterum*. The Report of this Diſcovery is made publick by *Sachs*, with Remarks. *Miſcel. Cur. Vol.* 1. *Obſ.* 100. which he concludes with one more ſtupendous than all I have cited, which he had from the *Sileſia* Chronicle, written long ſince by *N. Polinus*, and thus relates it: "*A. D.* "1581, a Woman that had borne Ten Children in Fifteen Years "Matrimony, conceived again, and at the full Time was delivered "through an Abſceſs of the left *Hypocbondria*. ——*Ex qua infans boni* "*babitus extractus qui baptizatus fuit, & annum unum cum dimidio ſu-* "*pervixit*; *Mater vero, ſummis in doloribus tertio die obiit.*

I am told by a Gentleman Hunter, that he lately found in the Paunch of an *Hare*, two full-grown Young Ones among the Bowels; but almoſt rotten: And three *Immature Embryo*'s in the *Uterus*. The former were certainly *Fætus* broke out of the Womb, *&c.*

Ibid. p. 432

XXXVI. 1.] A certain Woman lately being in ſtrong Labour, the Midwife finding the Birth coming very awkwardly, and more Legs than uſual, after a tedious Time delivered the Woman of Twins (deſigned ſo by Nature, but) joined together; there being but one Trunk of a Body with two Necks, on each a Head, with four Arms, two forwards and two backwards, thoſe backwards croſſing each other's Shoulders Side to Side; there is but one Navel, two Matrix's, two Fundaments, two Pair of Hips, four Legs. They have gone their full Time, having Hair on their Heads, and Nails on their Fingers and Toes. The Midwife tells me they were alive within leſs than half an Hour before they were delivered; they look very clear and well: The Children are near ——— Inches long; and, by reaſon of their being joined, are about ſeven Inches over.

An Account of a Monſtrous Birth; *by Mr* R. Taylor, *n.* 308. *p.* 2245.

2.] I have been informed of a Monſtrous Human Birth, ſeen at *London-Derry*, with two Heads, four Arms, and but one Body at the Navel:

—Another in Ireland; *by Mr* Neve, *n.* 320. *p.* 310.

Navel: It was of both Sexes, Female on the right Side, and Male on the left: The right Hand of the Male was behind the Female's Back, and the left Hand of the Female behind the Male's Back. This Birth was born alive, but lived but a little while.

An Alderman of the ſame City told me, that a Cow, in the Year 1706, had calved ſix Calves.

An Account of a Child's Crying in the Womb; by Mr W. Derham, *n.* 324. *p.* 485.

XXXVII. 1.] I lately viſited a Woman brought-to-bed this Day ſevennight of a Boy, that had cried in her Womb, at times, for five Weeks. The Child appears to be luſty and ſtrong; and is, ſince it's Birth, a very quiet Child. The Woman's Name is *Clark*, living in the Pariſh of *Hornchurch* in *Eſſex*:

She told me, The firſt time the Child cried was in the Night, as ſhe lay in Bed, after a great Pain, which forced her out of Bed, and gave her Apprehenſions of her Labour being nearer than her Reckoning: And every time after, whenever the Child cried, ſhe had violent Pains like thoſe of Labour.

Scarce a Day in all the five Weeks happened without Crying little or much: But the Woman obſerved, that every other Day it cried the moſt, and moſt certainly. The Midwife told me, She heard it cry ſeventeen times in half an Hour. It's Crying might be heard into the next Room; and ſometimes it ſeemed to be ſo hearty, that the Child would ſob again.

Both the Mother, and Midwife (a ſenſible Woman) amongſt other Things, told me, They found no great Difference between her in her Caſe, and other Women in the ſame Condition. I aſked the Woman whether ſhe had received any Falls, or Hurts, or was troubled with Longings more than with her Child before? (for ſhe hath had one Child before) She told me ſhe had received no Hurt, but was more inclining to Longing, but had not what ſhe longed for.

—On the ſame, *by the* ſame, *ibid.* *p.* 487.

2.] As to the Caſe of the *Child's crying in the Womb*, many are, I find, of Opinion, that ſuch a thing is abſolutely impoſſible.

Among the Authors that queſtion the Fact, two of the moſt conſiderable are *Etmuller* and *Diemerbroek*. *Etmuller* declares *Diemerbroek*'s Opinion, as well as his own, in his Diſſertation *de Abſtruſo Reſpirationis Humanæ negotio*, chap. 9. where he treats of Dr *Harvey*'s Problem, *Why the* Fœtus, *after Delivery, and before it had breathed, can live for ſome Hours in it's Afterburden,* &c. *but having breathed but once, cannot live ſcarce a Moment in that manner?* *Etmuller*'s Words are, *Vagitum Uterinum invincibile nonnulli exiſtimant argumentum pro* Reſpiratione Fœtus *in* Utero *demonſtrandâ. Sed cum muliercularum, quæ plerumque in hiſce caſibus invocantur teſtes, non ſatis circumſpecta ſit obſervatio, ut pro baſi Problematis hujus reſolvendi inſervire queat; merito ſuſpicamur cum Cl.* Diemerbroeckio *Vagitum, ſiquis certo obſervatus fuerit, è ſibilo inteſtinorum flatulentorum à fœtu compreſſorum ortum duxiſſe, qui ſæpe mirus auditur, ſuſpira gemituſque* *in quibuſdam mentiens. Similia quoque ad pipientium Pullorum, intra ovi teſtam adhuc exiſtentium, ſonum, quem editum ferunt aliquando, reponimus: Præprimis cum extenuatus aquæ vapor ad corpora tenuiora alliſus non minus ſibilum excitare obſervetur: uti id experimento probat Illuſtr.* Boyleus.

The Matter of Fact being thus called in Queſtion, may receive an Anſwer, in ſome meaſure, from the Caſe I have ſpoken of, and into which I have made ſome farther Enquiries. And notwithſtanding I ſhould be as much inclined as any one to doubt of the Fact (being clearly of Opinion that the Fœtus doth not live in the Womb by Breathing) yet the Evidence is ſo clear to me in the preſent Caſe, that I am fully ſatisfied it was really *Crying of the Fœtus*, and not Croaking of the Guts, or Womb, or the Effect of any Feminine Imagination.

For here we have a Thing happening not once, or twice only, but a great many times; almoſt every Day, and divers times in the Day; and that for near five Weeks together. Enough to have diſcovered any Miſtake, or to have undeceived even a fanciful Perſon.

The Child has been heard to cry aloud, ſo as to be diſtinctly heard by Perſons in another Room; and conſequently the Hearers could more eaſily, and certainly diſtinguiſh whether the Noiſe was *Crying* or *Croaking*. The Deſcription the Mother and others gave me thereof was, "That the Noiſe the Child made, was as if a Born-Infant had cried eagerly, ſhut up cloſe in a Tub."

The Crying ſeemed to be ſo eager and hearty, as to end in Sobbing, like what is obſervable oftentimes in Born-Infants.

It was heard not alone by the Father and Mother, or one or two beſides, but by many of the Neighbourhood, and many of them Perſons long uſed to Children; who do all with the greateſt Aſſurance affirm it to have been as manifeſt Crying, as ever they heard from a Born-Infant, and nothing like any Noiſe of Wind, or the Guts: As on Enquiry they all particularly told me.

The Midwife moreover told me, that laying her Hand on the left-Side of the Woman's Belly, where the Child lay when it cried, ſhe could plainly feel a Motion under her Hand, like that of Reſpiration, every Blaſt of the Child's crying ſenſibly touching upon her Hand.

Theſe Paticulars being conſidered, do not only prove the Reality of the Thing, but ſhew the Caſe to be very conſiderable. I have met with many Inſtances of this Nature in Authors, but not one that was of ſo long Continuance, and in which there were ſuch frequent Reiterations of the Crying. The learned *Verzaſcha* of *Baſil*, hath given us a Catalogue of many of them in the third Obſervation of his *Obſerv. Med.* Paſſing by the Caſes he mentions atteſted only by illiterate Perſons, I ſhall name only a few that ſeem to have more ſenſible Perſons for their Evidence, *Ant. Deuſingius* in his *Diſſert. de Generat. Fœtûs*, tells us, 'how that he had it from his Colleague *Maneus*, that the Child cried in his Wife's Womb, and the ſame befel the Wives of Mr *Salmuth*, and Mr *Grœnwolt*.' His next

Relation is that of Dr *Needham*, of the Fœtus crying in the Womb of an *Engliſh* Lady of Quality; as ſhe, her Huſband, and Chaplain, were together at Supper; it is in the Doctor's Book, *De Formato Fœtu.* The laſt Inſtance is of *Chriſtian* II. King of *Denmark*, who was heard to cry before he was born. Now theſe being Caſes atteſted by Perſons that may be ſuppoſed of better Underſtanding, ſeem to claim ſomewhat more of Credit: The latter being the Caſe of a King, and in all Probability heard by ſome of the beſt Quality about the Court; the next heard by the Chaplain as well as Perſons of Quality themſelves, and that three times one after another; and the former coming within the Cogniſance of Gentlemen, and they probably Men of Learning too.

From theſe Caſes ſo well atteſted, I conclude, That the Fœtus doth really cry ſometimes in the Womb; altho' how this is performed is hard to account for; Surely not without Reſpiration. And therefore I am apt to think, that altho' the Fœtus doth not ordinarily breathe in the Womb, yet it is poſſible for it to have an occaſional, temporary Reſpiration there. But whether in ſuch Reſpiration, any of the Blood paſſeth into the Lungs, or whether it doth not continue it's Circulation thro' the *Foramen Ovale* only; Or if any more than ordinary Blood ſhould by ſuch Reſpiration get into the Lungs, whether it may not eaſily and without Inconvenience be diſcharged thence, during that State of Life the Fœtus leads in the Womb; All theſe Doubts I am unable to determine. But however thus much favouring my Opinion, may be obſerved in the *Sea-Calf*, and ſuch other Animals as have the *Foramen Ovale*; That the Circulation of their Blood is continued, notwithſtanding the Diſcontinuance of their Reſpiration for a long time.

As to the *Peeping of Chickens in the Egg*, about which *Etmuller* hath the ſame Doubt, as of the *Vagitus Uterinus*, I have myſelf divers times heard that, both from Chickens and Ducks. And a Perſon converſant in ſuch Matters, aſſures me, That a little before the Hatching, ſhe hath often, and can at any time cauſe ſome Chickens, and Ducklings to peep in the Egg. She ſays, that ſometimes whole Neſts of Eggs will yield a Cry, ſometimes only ſome particular Eggs: But that ſuch Eggs as have once afforded a Peeping, may be made to peep and cry at any time by ſhaking the Egg, and putting the Youngling into a Diſorder. And ſometimes where there hath not been any Noiſe before heard, the Bird hath been made to cry, by ſhaking the Egg in which it was encloſed.

The Cauſe of this peeping in the Shell, I take to be from ſome Uneaſineſs the young Bird may find there. It being arrived to it's perfect State in the Egg, is either weary of it's Confinement therein, and deſireth more Liberty: or it lies uneaſily, or elſe is offended with ſhaking, and therefore peepeth and crieth, as when uneaſy out of the Shell.

And after ſuch manner I take it to be with an Human *Fœtus*; that it is in ſome Diſorder, and uneaſy in the Womb, and therefore cries as well in as out of it. Thus I am apt to think it befel the *Fœtus* I have ſpoken of, *viz.* That it lay very uneaſily in the Womb all the while it cried there, the Mother being in great Pain before, and during the time of the Child's crying; and the Child itſelf being cloſely confined, and pent up on the left Side the Mother's Belly *all the time of the Crying only, and not all the 5 Weeks.* Perhaps alſo the Child might find ſome Uneaſineſs from a Bone the Midwife told me ſhe found to ſtick out ſomewhat farther than ordinary: Which, upon Examination, I take to be one of the *Vertebræ* of the Back-bone. And if this Bone cauſed Uneaſineſs to the Child, it might alſo by that means occaſion, perhaps, the Woman's Pains I ſpake of: But theſe are only Gueſſes and Imaginations of my own.

XXXVIII. There was in *Eſſex* a Great-bellied Woman who had the *Small-Pox*, and was pretty well recovered, ſo that ſhe was able to take ſomething to purge her after it: And on *Auguſt* 30, 1712, ſhe took a Purge which did not work; and on *September* the 1ſt, another Purge, which gave her only a Stool or two. Upon which, *September* the 3d, ſhe took another ſtronger Purge, that worked ſo violently upwards and downwards, that ſhe fell into Faintings and Convulſions; about which time I conceive her Child within her died, but of which ſhe was not delivered till *September the* 8th. The Child was a Female, and in Appearance well made, luſty and ſtrong. At it's Delivery, the Midwife judged it had been dead five or ſix Days; ſo that the Belly was burſt, and the Bowels came out, and the whole Body was inclining to be rotten.

Of a Woman *big with* Child, *and having the* Small-Pox, *deliver'd of a* Child *having the ſame* Diſtemper; *by Mr* W. Derham. *n.* 337. *p.* 165.

The Child was very full of the *Small-Pox*, ſo full that the Midwife ſaid hardly a Pin's Head could be put between the Bliſters, which were very plump, and full of Matter like the Puſtules of an Adult, when the *Small-Pox* is at the Height, only a little depreſſed in the middle. But as full as the Child was, the Mother had as few, and very favourably; her Child, I ſuppoſe, undergoing that which would have been more ſevere upon her.

I leave it to others to determine whether when a Woman hath the *Small-Pox* in Pregnancy, it be likely that the Child ſhould be in Danger of catching and having that Diſtemper after it's Birth? And whether this Child had the *Small-Pox* at the very ſame time the Mother had it, and not rather afterwards, by reaſon the Child was full of it ſome time after the Mother was well recovered?

I am inclined to think, that the great Flux and Tendency of the Blood to the Child in the Womb, might draw in the Humour, and prevent the greater Eruption of the *Small-Pox* in the Mother; and that for want of a due Expence thereof, the Remainder afterwards broke out in the Child, and that the Child really had it after the Mother; Nature making the Diſcharges upon the Child, which were not compleated on the Mother.

The Human Allantois *diſcovered; by Dr* R. Hale. *n.*271. *p.*835.

XXXIX. Moſt of the Antients allow a *Human Allantois*, not from their Experience of it, but becauſe they took it for granted, that Men and other Animals were alike, in the *Viſcera*, *Membranes*, *Veſſels*, &c. And the Accounts they have left of many Parts, particularly of the *Urachus* and *Allantois*, (as to it's Name, Figure, Scite, &c.) agree only to their Appearance in Brutes. I ſhall ſay nothing of the *Allantois* in Brutes, ſince it is granted by moſt Anatomiſts, to be in theſe Animals, and ſufficiently deſcribed by Dr *Needham*.

This Anatomiſt alſo firſt diſcovered part of the *Allantois* in *Human Subjects*; but neither he, nor any other, has taken the right Method of finding it entire. (*b*) Dr *Needham* ſays, that after the *Amnios* is cleared, and left fixed to the *Umbilical Rope*, you may divide by the Fingers, or Knife, the remaining Part of the *Involucra* into two Membranes: The *exterior* he truly calls the *Chorion*, the *interior* he takes to be the *Allantois*. But by theſe ways of Separation, you will preſently tear the *Allantois*, and be able to diſcern only ſome ſmall Pieces of it. Beſides the *Allantois* is at firſt Sight ſo like the *Amnios*, that (*c*) many who ſuppoſe the *Amnios* double, and that it's Coats are eaſily ſeparable, have taken theſe Pieces of the *Allantois*, for broken Parts of one of the Coats of the *Amnios*. Whereas having firſt found the *Hole* whence the *Urine* came forth, (if the *Allantois* is not too much torn) you may blow up the *Allantois* with a Pipe to it's full Dimenſions, and then ſee it's true Shape, the *Fundus*, the *Cervix*, the Inſertion there of the *Urachus*, it's Relation there to the other Membranes, &c. Be the *Allantois* never ſo much torn, yet this way you may eaſily ſeparate many Inches of it from the *Chorion* and *Amnios*. Which eaſy Separation demonſtrates a Diſtinction of Membranes, ſince no double Membrane can be divided by the Breath alone.

Indeed *Hoboken* and (*d*) *Diemerbroeck* make it a very eaſy thing to ſeparate the *Allantois* from the other Membranes, only by the Fingers; but 'tis plain from their Deſcriptions that they never ſaw one entire. Amongſt other Miſtakes *Diemerbroeck* ſays, That the Urine of a *Fœtus* lies between the *Urinary Membrane* and the *Chorion*; as tho' not contained in a diſtinct Bladder, but in a Cavity made partly from the *Chorion*, partly from the *Urinary Membrane*.

I confeſs *De Graaf* (*e*) tells us, that by blowing with a Pipe into a Hole made thro' the *Chorion*, all the Membranes of the *Secundines*

(*b*) Cap. 3, & 7. (*c*) Diemer. lib. 1. cap. 31. Horn. parag. 69. (*d*) Lib. 1. cap. 31. (*e*) De Mul. Org. cap. 15.

will appear diſtinct. He has alſo delineated an *Allantois*, with the other Membranes, *&c.* as he ſays he found them. Yet this (*f*) Figure muſt have been drawn from his own Fancy, and not from any Preparation, for theſe Reaſons. 1ſt, Becauſe by this way of Separation, you can only part the *Allantois* from the *Chorion*, but never ſee it's true Dimenſions, nor any Appearance of a Bladder; for a Bladder, as the *Allantois* is, can be ſhewed only by blowing into it's Cavity, or by finding it full. Yet in this Figure no Sign can be obſerved, where 'twas blown up, and tied, *De Graaf* alſo ſpeaking of making a Hole only in the *Chorion*. Nor can this *Allantois* be ſuppoſed full of Urine, becauſe 'tis not of the Shape of a full *Allantois*; and our Author himſelf calls it only the inflated Part of the *Allantois*. However I cannot conceive how the *Allantois* could remain partly filled with Air (any more than it might with Urine) ſo long as till this *Fig.* was drawn, unleſs ſome *Hole* was tied up, whence the Urine came forth, and the Air was blown in. 2dly, Becauſe in this *Fig.* the *Umbilical Rope* ſeems to run through both *Amnios*, and the *Allantois*, to it's Inſertion on the *Placenta*. Whereas the *Allantois* is no where perforated by the *Umbilical Rope*, nor does it any where paſs thro' the *Amnios*, but only runs under it, at the Place of it's Inſertion on the *Placenta*. If the *Navel-ſtring* could be allowed to enter the *Amnios* at I (*g*), and to paſs under it to the *Placenta*, why ſhould it not appear (which it does not) under the *Amnios*, as well as the thin Subſtance of the *Allantois?* Again, according to *De Graaf*'s Poſition of the *Secundines*, (which is the Reverſe of *Fig.* 161. where the *Navel-ſtring* lies under the *Allantois*) nothing could hinder a plain View of the Place where the *Navel-ſtring* is ſet on to the *Placenta*. This will be eaſily apprehended, by ſuppoſing the Part H in my Figure, *Fig.* 161. to lie uppermoſt, the *Fundus* G and *Navel-ſtrings* being turned over; for then the *Strings* will run over the *Allantois*, as in *De Graaf*'s Cut, and it's Inſertion appear plain on the *Placenta*, which yet cannot be diſcovered in his (*g*) *Fig.* I am ſure the whole is irregular, and I take it to be fictitious. As for the *Urinary* (*g*) Membrane G, it ſeems to be the *Allantois* of a *Colt* (where (*h*) *Needham* ſays, the *Umbilical Rope* runs through the *Urinary* Membrane) not leſs abſurdly added to the *Secundines* of a *Human Fœtus*, than the *Secundines* of a *Whelp* are to a like *Fœtus* by *Veſalius*.

'Tis moſt evident that *De Graaf* knew nothing of the true Shape of this Membrane, and that he had never ſeen one entire, becauſe (*i*) he conſents to (*) *Needham*'s Deſcription of it is as true, which yet is falſe in ſeveral Particulars. For 1ſt, The *Urinary* Membrane does

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(*f*) De Mul. Org. Cap. 15. Tab. 22. (*g*) Tab. 22. De Graaf. (*h*) *Vide* B. Tab. 2. (*i*) De Graaf, cap. 15. (*) Cap. 3. de format. Fœt.

not cover the whole *Fœtus*, (as he affirms) but only that Part of it which reſpects the *Chorion*, and does not lie on the *Placenta*; for the *Allantois* can be extended at fartheſt but to the Edges of the *Placenta*, where the *Amnios* and *Chorion* are ſo cloſely joined by *Fibres*, that no Membrane can come between them. Wherefore, 2*dly*, The *Allantois* is not every where faſtened to the *Chorion*. And conſequently, 3*dly*, The *Allantois* cannot be of the ſame Shape that the other Membranes are of; nor be like the *Allantois* of a *Colt*, which contains the *Fœtus* in the *Amnios*; all which, nevertheleſs, *Needham* (*k*) aſſerts. In ſhort, Dr *Needham* had ſeen only Pieces of the *Urinary* Membrane, but never an intire one, and ſo could only gueſs at the Shape, *&c.* of it, from what he had obſerved in *Mares* and *Glanduliferous* Animals. He might have made a better Gueſs at the Figure, Scite, *&c.* of a *Human Allantois* from that of a *Whelp*, which does not every where encompaſs the *Fœtus*, as he obſerves.

Bidloo, in moſt of the *Figures* of the *Secundines*, letters ſome *Veſtigia* of the *Urinary* Membrane; but in any of theſe *Figures*, you only ſee broken Pieces of one, ſo confuſedly placed, that no *Idea* of it's Bigneſs, Shape, or Situation can be formed from them. I muſt confeſs, that oftentimes the Membranes of the *Secundines* are ſo torn, that no Art can exhibit an entire *Allantois*. However, among the many *Secundines* that have come under the Hands of Anatomiſts, ſeveral, no doubt, muſt have been entire enough for a fuller Diſcovery than they have made, had it not been by their ways of proceeding, (*viz.* by Knife, Fingers, or blowing under the *Chorion*) impoſſible to diſcover any thing plain or ſatisfactory, even in the faireſt Subjects.

The Difficulty of finding this *Membrane*, is by no means an Argument againſt the Exiſtence of it: But a Woman that dies big with Child, is ſo fair a Subject for the Diſcovery of *three Membranes*, that I wonder (*l*) *Parey*, having ſuch an Opportunity, could find but two, if he was ſo careful as he ſays he was. The accurate Dr *Tyſon* obſerved *three Membranes*, ſome Years ago in a like Subject. After the *Chorion* was divided and laid aſide, he ſaw *two Bladders*, containing Liquors of different Colours; which he preſſing one towards the other, did not mix, but remained diſtinct. This Obſervation fully ſatisfied that Anatomiſt, as to the Exiſtence of an *Allantois*; and it's Figure, Texture, Scite, *&c.* might alſo have been diſcovered by him, had not the leſs-curious Spectators been impatient to paſs on to the other Parts of the Diſſection.

Some deny an *Urinary* Membrane to a *Human Fœtus*; becauſe they ſuppoſe the *Urachus* to be impervious, and that therefore there would

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(*k*) Cap. 7.

(*l*) Lib. 3. cap. 34.

be no Paſſage for the Urine, conſequently no need of an *Allantois. Nedham* (*m*) indeed ſays, That he could never find any Sign of a Cavity in the *Urachus*; yet is of Opinion, that by blowing from the *Bladder*, the Air might be forced through a *Human Urachus*, as eaſily as he has often done it through that of a *Whelp*. I do not underſtand why Dr. *Needham*, and (*n*) others, ſhould inſiſt ſo much upon an apparent Cavity in the *Urachus*, or expect that Air ſhould neceſſarily paſs through it, upon blowing, and think that otherwiſe it cannot be fit for the aſſigned Office; ſince many Bodies, as Membranes, *&c.* will not admit Air, *&c.* yet let Water paſs freely through them. It will not ſeem ſtrange, that Water ſhould paſs through the Subſtance of the *Urachus*, if we conſider that the Cavity of the *Urachus* to the *Navel* is open, as appears by Inflation, or Injections, (to ſay nothing of thoſe who are mentioned to have made Water by the (*o*) *Navel*); and that the reſt of the *Urachus* is pervious, though not plainly hollow (the Urine rather ſoaking gently, than running through it's more ſtraight Tubes) may be gathered from hence; 1ſt, That the Subſtance of the *Urachus*, (as well as the Cavity of the *Allantois*) is always found turgid with a Liquor, that in Colour, Taſte, and Smell, ſeems Urinous. 2dly, That ſince the *Mucous* Coat of the Inteſtines is demonſtrated to be Vaſcular, by Mr *Leeuwenhoeck*, therefore the Mucous Subſtance of the *Urachus* may alſo be Vaſcular. 3dly, That Urine may as eaſily ouze through theſe Mucous Veſſels, as other Fluids run through Vaſcular *Cartilages*, and *Bones*, &c. or the Chyle into *Lacteals*, whoſe Orifices, as (*p*) *Leeuwenhoeck* obſerves, will ſcarce admit of Particles ſo big as the 1000000000 Part of a Grain of Sand) the great Cavity of the Inteſtines being open at the ſame time; or as eaſily as groſſer Parts of the *Semen* paſs the Tubes of the *Teſticles*, whoſe Cavities are not more perceptible. I am ſure the Urine is more aſſiſted in it's Motion by the *Detruſor Urinæ*, *&c.* than any of theſe Fluids can be by the Heart, or other *Muſcles*.

(*q*) Others will not admit of an *Urinary* Membrane, they thinking it would be uſeleſs; becauſe they imagine, that when the Bladder is full, the Urine muſt be diſcharged at it's *Cervix*, and not at it's *Fundus*, by the *Urachus*. But in anſwer to this, the Urine can never paſs through the *Cervix* and *Urethra*, unleſs the *Abdominal Muſcles* contract; becauſe we never void Urine naturally, but by the Help of theſe Muſcles, nothing leſs being able to force open the *Sphincter*

(*m*) Cap. 3. cap. 4. cap. 7.

(*n*) Parey, lib. 3. cap. 34. Mauriceau, lib. 2. cap. 4.

(*o*) Fern. lib. 6. cap. 13. Senn. lib. prac. 3. par. 8. ſect. 2. cap. 10. Lauren. lib. 8. queſt. 17.

(*p*) Vol II. epiſt. 68. p. 235.

(*q*) Barth. lib. cap. 36 & 37. Riolan. lib. 6. cap 3, & 4. Parey, lib. 3. cap. 34.

Veſicæ. Now it being more than probable that theſe Muſcles never act before *Reſpiration*, no Urine can paſs through the *Sphincter* before the Child breathes. No Reaſon can be given why the *Abdominal Muſcles* of a *Fœtus* ſhould voluntarily contract; ſince neither the Quantity nor Quality of the (*r*) Urine can excite to ſuch an Action. For when the Bladder is too full of Urine, it will ouze through the lax ſpongy Subſtance of the *Urachus*, being gently preſſed by the *Detruſor* alone. There would ariſe many Inconveniencies from the voluntary Contraction of the *Abdominal Muſcles* of a *Fœtus*, as voiding *Fæces* as well as *Urine*, into the *Amnios*, which would be more prejudicial than (*s*) Sweat, &c. Yet if we ſhould ſuppoſe the *abdominal Muſcles* of a *Fœtus* to act, the Urine will however paſs where it can moſt eaſily, *i. e.* through the *Urachus*, which is partly open, and altogether of ſuch a Texture, as in no wiſe can hinder the paſſing of the Urine, much leſs be able to reſiſt a conſiderable Force, as the (*t*) *Sphincter Veſicæ* can. Beſides, the *Urachus* is not only thus qualified for the Admiſſion of Urine, but when the Mother lies down, 'tis almoſt upon a Level with the *Urethra*, and what has once paſſed the *Urachus*, cannot return by reaſon of the Length, Situation, and peculiar Structure of it: And the (*u*) *Pudendi Clauſura* ſometimes happening in both Sexes, demonſtrates, that then, at leaſt, the Urine cannot paſs through the *Urethra*.

Dioni (*w*) not finding any *Allantois*, nor an *Urachus* plainly pervious, thinks there is no need of either, on another Account. For he ſuppoſes that the Blood, which ſerves for the Nutrition of the *Fœtus*, is depurated from all Excrement. But I cannot apprehend, what ſhould make this Portion of the Blood and Chyle freer from Excrement, than the reſt of the *Maſſa Sanguinea*. There is indeed no Portion of it, which does not contain Parts unfit for *Aſſimilation* and *Nutrition*. Our Author would have been convinced of this Error, had he ever opened *Abortions* of five Months old or upwards, their Bladders being always full of Urine, and ſome *Fæces* conſtantly in the Inteſtines. 'Tis difficult to determine when this Separation of *Urine* firſt begins, but I am apt to think it much ſooner than is generally ſuppoſed. *Fig.* 163, is the *Allantois* of a very ſmall *Abortion*, which I have ſtill by me. Since all the Parts are perfectly formed before *Impregnation*, not very long after *Impregnation* they may begin to perform their Offices. No doubt they begin as ſoon as there is Occaſion for any Separation, and

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(*r*) Barth. lib. 1. cap. 37. Need. cap. 3. pag. 81. (*s*) Harv. de Humor. pag. 547. (*t*) Gal. de uſu part. lib. 15. (*u*) Senn. Prac. lib. 4. part. 1. ſect. 1. cap. 3. Mauric. lib. 2. cap. 3. (*w*) Pag. 145.

a Separation of Urine is neceſſary when the *Fœtus* is firſt nouriſhed by the *Umbilical Arteries*.

The Exiſtence of an *Allantois* is denied by (*x*) ſome who grant an *Urachus*, but will have it convey the *Urine* to between the *Amnios* and *Chorion*. (*y*) *Diemerbroeck*'s Opinion is ſomewhat like this, only he would have the *Urine* lodged between the *Urinary* Membrane and the *Chorion*. Theſe Men do not conſider that the *Urine* in this Caſe would get into the *Amnias*, as well as the *Succus Nutritius* of the *Chorion*, whether imbibed from the *Uterus* by the *Chorion*, or ſeparated by it's *Glands*. Such a *Succus Nutritius* of the *Chorion* is granted by the (*z*) Maintainers of the fore-cited Opinions, as well as by thoſe who deny an *Allantois* altogether, or (*a*) ſuppoſe it to have a different Figure, &c. from what *Diemerbroeck* aſſigns it. The Tranſudation (or Filtration through the Membranes) of this *Succus* ſeems moſt likely in *Mares* and *Sows*; for in a (*b*) *Mare* the *Chorion* is not joined to the *Uterus* till ſhe is half gone, and in a (*c*) *Sow* it does not adhere to the *Uterus* till near the End of her going with young. But 'tis moſt evident that the Urine of a *Human Fœtus* is not contained between the *Chorion* and *Amnios*, nor between the *Chorion* and *Allantois*, from the cloſe Connexion of theſe Coats to one another; alſo from the Obſervation of Midwives, who often find a Bladder of Water (they call it a *By-Water*) offering itſelf before the *Child*, whereas the Humour of the *Amnios* is little, and of the *Chorion* much leſs, and of another Colour, &c. at the Time of *Birth*. This *By-Water* is taken Notice of, as an Argument for an *Allantois*, by Mr *Cowper*.

Dr *Harvey* (*d*) will not allow an *Allantois* even to *Brutes*, and fancies the *Allantois* and the *Chorion* to be the ſame Membrane, that has two Names, the firſt from it's Shape, the other from it's Office, or Number of Veſſels. Yet 'tis plain from *Galen* and all the Antients, that they meant two diſtinct Membranes by the *Allantois* and *Chorion*. Dr *Harvey* thinks, that a *Fœtus* does not void Urine, but that the Bladder contains it, till the Time of *Birth*. What was offered againſt *Dioni*'s Opinion, may ſerve for an Anſwer to this alſo. Becauſe 'twas impoſſible for this Anatomiſt not ſometimes to obſerve an *Urinary* Bladder, he has thought of ways to explain ſuch *Phænomena* without granting an *Allantois*. In (*e*) *Sheep* and *Does* he had ſeen as it were a certain *Proceſs* between the *Umbilical* Arteries full of Urine. This Proceſs is no doubt the *Allantois*, though (*f*) *Bartholinus*

(*x*) Aquapend. lib. 1. cap. 7. Fallop. (*y*) Lib. 1. cap. 31.

(*z*) Harv. de Hum. & Membr. Needh. cap. 2, 3, & 7. Barth. lib. 1. cap. 36. Graaf. de Mul. Org. cap. 15.

(*a*) Needh. Graaf.

(*b*) Harv. de Membran.

(*c*) Need. cap. 2. 3, & 7. Graaf. de Mul. Org. cap. 15.

(*d*) Harv. de Memb. & Humor.

(*e*) Harv. de Memb. & Humor.

(*f*) Lib. 1. cap. 37.

linus calls it the *Urachus*. Again, he thinks what is called by others an *Allantois* (if it is not the *Chorion*) is ſome Coat accidentally formed from a Reduplication of the Membranes; becauſe (ſince every Membrane is double) Nature may upon a Streight, lodge the Urine between a *Duplicature*. Yet he does not tell us how *his Duplicature* is to be filled, he allowing no *Urachus*. But, in ſhort, this *Urinary* Bladder, can be no *Duplicature* of the other Membranes, ſince in all Animals it differs from them, as to Figure, Texture, and in having an *Urachus*, which no other Membrane has. And ſince every Animal that has a Bladder, muſt have a like Neceſſity for a Receptacle of Urine, till born, ſince alſo the *Urachus* is ever alike inſerted in the ſame *Species* of Animals, and the *Urinary* Bladder conſtantly the ſame, as to Shape, Texture, Situation, *&c.* the *Urachus* and *Allantois*, with it's (g) *By-Water*, can be no accidental or preternatural Things.

All the Objections and Difficulties about an *Human Allantois* being thus cleared, I ſhall now conſider what may be offered againſt theſe *Figures*. It is not my Deſign to give an entire Hiſtory of the *Secundines*, &c. or repeat what can be found in other Anatomiſts; but only to relate what I have diſcovered of an *Human Allantois*, *Amnios*, *&c.* which is altogether new, or different from the Obſervations of others.

The *Allantois*, Fig. 161, I diſcovered in *March* 1698-9, the other, *Fig.* 163, ſeveral Years ago.

Fig. 161. *Fig.* 161. Repreſents the *Secundines* of *Twins*, to ſhew the *Allantois*, and it's Relation to the other Membranes, *&c.* after the Parts were prepared and dried.

A, A, A, A, Part of the *Chorion* expanded. B, B, B, a *Line*, expreſſing the Edges of the *Placenta*. C, C, C, the *Amnios* which is united to D, the *Allantois*, at E, E, E, the Line of *Union*. F, the *Cervix* of the *Allantois*. G, a *Hole* at the *Fundus* of the *Allantois*, whence the Urine came forth, and where the *Allantois* was blown up. H, Part of that half of the *Allantois*, which lies under the *Line* of *Union*, and immediately covered the *Fœtus's*, unleſs it is ſuppoſed that the *Amnios* is continued under the *Allantois*. I, I, two *Stiles* or Probes thruſt under the *Amnios*. They ſuport the *Allantois*, and keep open the *Aperture* * * * * of the *Amnios*, whence the *Twins* came forth. K, Part of the *Placenta*, with ſome Blood-Veſſels injected. L, L, L, L, the *Arteries* of the *Navel-ſtring* filled with red Wax. M, M, the *Umbilical Veins*, filled with green Wax. N, a *communicant Artery*, by means of which all the *Arteries* of both *Navel-ſtrings* were filled at once, and the Veins were filled by one *Injection* in like manner. O, a

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(g) Harv. de Hum.

Pin that keeps out the *Amnios*, where from the Edge of the *Placenta* it runs partly to the *Line* of *Union*, or *Adheſion*, and partly over the *Placenta*. P, Part of the *Chorion* at the Edge of the *Placenta*, where it runs under the *Amnios* on the *Placenta*. Q, a Pin that by a Thread helps to pull open the *Aperture* of the *Amnios*. R, R, R, the *Urachus*, lying between the *Arteries*. *a*, *a*, *a*, *a*, Fibres or Veſſels, which faſten the *Allantois* to the *Chorion*.

Fig. 162. Exhibits a *Side-view* of the ſame Preparation, that the Inſertion of the *Urachus*, &c. may be better ſeen. Fig. 162.

N. B. That A and all the ſame Letters in theſe three *Figures*, denote the ſame Parts in every one.

S, ſhews the Courſe of the *Urachus* R, at F, in pricked Lines. T, Part of the *Amnios* raiſed from the Edge of the *Placenta*, to diſcover the *Placenta* K, and V. V. That Part of the *Allantois* which is below the *Line* of *Union*, near it's Neck F.

Fig. 163. Shews an entire *Allantois* of a very ſmall *Abortion*. Fig. 163.

N. B. This *Allantois* was eaſily ſeparated from the other Membranes between which it lay; and the *Amnios* remained an entire *Bladder* or Membrane under the *Allantois*.

Now ſome to whom I have communicated theſe *Figures* object, that what is called the *Line* of *Union* can be no real thing.

As to this, I do not know whether the *Allantois* of *Twins* may not require ſuch a Conjunction to ſuſtain, and keep ſteady a greater Quantity of *Urine*: nor can I reſolve whether the *Allantois* of *Twins* (like that of a ſingle *Fœtus* in *Fig.* 163.) may not be diſtinct, and ſeparable from the *Amnios*, but was not diſcovered by me to be ſo, through want of Skill or Care. However, the Reaſons why ſuch a *Line* was figured, are theſe: 1. Altho' I uſed more Force, with equal Care, to ſeparate the *Allantois* from the *Amnios* in this Place than in any other (where nevertheleſs the Separation was very eaſy) yet I could not divide theſe Membranes farther than that *Line*. 2. This *Line* ſeeming ſo regular as to divide the *Allantois* into two equal Parts, I could not take it to be the Effect of Chance, or my Separation. 3. The Part H below the Line E E was alike in *Tranſparency* to that Part of the *Allantois* D above it. Whereas had the *Amnios* been ſtill joined to the *Allantois* (as theſe Objectors ſuppoſe) the *Allantois* below this *Line* muſt have appeared thicker than that Part above it, ſince the *Amnios* alone is much thicker than the *Allantois*. 'Tis eaſy indeed to conceive the *Amnios* running an entire Bladder, or Membrane, under the *Allantois*, and perhaps it may be ſo; but I ſhall not conceal what I did obſerve, or make out by Fancy, what I could not diſcover in Fact.

Others have thought this *Allantois* to be an *Amnios* of one of the *Twins* belonging to theſe *Secundines*. This Objection, tho' it may ſeem plauſible, yet is of no Force. For 1ſt, This *Allantois* is much finer to the Touch, and alſo much more tranſparent, than the other *Amnios*; which ſtill remains ſtiff, whilſt the much thinner *Allantois* ſinks upon the leaſt Blaſt of Air, notwithſtanding the Stiles I, I, which aſſiſt it. 2dly, This *Allantois* had two viſible *Urachus*'s, and it is of an oviform Figure, ſomewhat like the common Cuts of a Man's Bladder (for a true Cut of a *Human Bladder* I never yet ſaw, for it ought to be made much bigger, as it really is, at it's *Cervix*, &c.) Alſo this *Allantois* no where touches the *Placenta*, unleſs at the *Neck* F: But on the contrary, the *Amnios* is of the ſame irregular Figure, as the Poſition, Motion, *&c.* of the *Fœtus* require. Likewiſe, it covers the whole internal Surface of the *Placenta*. 3dly, They who make this Objection muſt ſuppoſe ſome *Hole* in this Bladder, and in the *Amnios*, thro' which one *Umbilical Rope* may paſs from the *Placenta* to the *Fœtus*. But ſuch a *Foramen* would be preternatural, becauſe the *Navel-ſtring* only runs from the *Placenta* to the *Fœtus* under a *Coat* taken from the *Amnios*, and lies with the *Fœtus* in the Cavity of the *Amnios*, that is no where perforated. 4thly, The *Hole* at the *Fundus* G was ſcarcely wide enough to receive the End of a Man's Finger, whereas the *Twins* did not want ſix Weeks of their full Time. Since therefore a *Fœtus* of near eight Months could not poſſibly paſs this *Orifice*, this Bladder could not be an *Amnios*.

Nothing in theſe *Secundines* is preternatural, only ſome things were not before obſerved. Hitherto Anatomiſts have not allowed *Twins* to lie in a common *Amnios*, but ſuppoſed each *Fœtus* to have a diſtinct *Amnios*. The Reaſon of this Opinion might be, that ſome denying any *Urinary* Membrane, called every Membrane they found (except the *Chorion*) an *Amnios*, and theſe finding two Membranes in the *Secundines* of *Twins*, ſuppoſed them to be two *Amnios's*. That others granting an *Allantois*, but not diſtinctly diſcovering it, but only two Membranes, alſo imagined them to be two *Amnios's*. Both of theſe taking that for an *Amnios*, which might really be an *Allantois*. But ſince one *Chorion*, and one (*h*) *Placenta*, (the (*i*) *Placenta* and (*i*) *Chorion* being ever of the ſame Number) generally ſerve *Twins*, (nay, ſometimes three *Fœtus's*) why ſhould it ſeem ſtrange, that one *Amnios* (at leaſt ſometimes) and one *Allantois* ſhould ſerve the like Number?

I am not ignorant that (*k*) *Mauriceau*, and (*l*) *Diemerbroeck* think there is an abſolute Neceſſity for every *Fœtus* to lie in a diſtinct *Amnios*, and that otherwiſe *Twins* in the ſame Membrane would grow together, and make a *Monſter*. *Aquapendens* (*m*) further ſays, that all *Ova Gemellifica* produce ſome other Sort of *Monſter*. Yet 'tis moſt certain, that *Ova*

(*h*) Mauriceau, lib. 2. cap. 4. Need. cap. 2. Barth. lib. 1. cap. 36. Diemerb. lib. 1. cap. 30.

(*i*) Diemer. lib. 1. cap. 31. Graaf. cap. 15.

(*k*) Maur. lib. 2. cap. 3, & 4.

(*l*) Diem. lib. 1. cap. 31.

(*m*) Pag. 19.

Gemellifica

Gemelliſica do exclude two perfect *Chickens*, however not both alive. Dr *Harvey* (*n*) indeed thinks it poſſible, that ſuch an *Ovum* may produce a monſtrous *Chick*, if it's *Vitelli* are contained in the ſame Membrane, *&c.* yet does not poſitively ſay it muſt be ſo. For my Part I can't ſee any more Reaſon why *Twins* in one *Amnios* ſhould grow together, than that the *Hands* or *Heels* of the ſame *Fœtus* ſhould grow to it's own Body. How can the Humours that lubricate a ſingle *Fœtus* and help it to move, join two together? Since the Humours are the ſame, and the Parts of the ſame *Fœtus* as tender as thoſe of *Twins* are, and lie as cloſe to one another as *Twins* do. 'Tis very obſervable, that amongſt all the *Monſters* we read of, there are very few, which ſeem to be made of *two* entire Bodies joined together, and that moſt of theſe upon (*o*) Diſſection were found to have but *one Heart*, *one Liver*, &c. whence 'tis moſt plain, that theſe *Monſters* (and no doubt all others) were originally *Monſters* in the *Ova*, before Impregnation, and not ſo from want of an *Amnios*. Yet *Diemerbroeck* (*p*) does not a little boaſt of having firſt (as he thinks) found the Reaſon why *Twins* muſt lie in diſtinct *Amnios's*. But ſince the Matter of Fact (ſometimes at leaſt as in theſe *Secundines*, where there was only one *Amnios*, and two regular *Fœtus's*) is not true, his Argument for a Neceſſity of two *Amnios's* for two *Fœtus's*, will never prove valid, even where *Twins* and two *Amnios's* are found. Indeed any Part may be made to grow to any Part, as we ſee in the Cure of *Hair-lips*, &c. but then the Fibres muſt be firſt broke, before there can be any *Union*. Now I can't conceive what ſhould naturally break the Fibres of the *Twins* in the *Uterus*. But although 'tis evident from what has been ſaid, that *Twins* may lie diſtinct in the ſame *Amnios*, yet there muſt be as many *Urachus's*, as *Fœtus's*. In theſe *Secundines* I ſaw two running over the *Placenta*, to the *Neck* of the *Allantois*, which I communicated to ſome Phyſicians, before the Parts began to grow dry. The *Urachus* paſſes under the *Amnios* as the other *Umbilical Veſſels* do, and runs from that part where the *Umbilical Rope* is ſet on to the *Placenta*, ſtraight to the *Cervix* F. S, deſcribes the Courſe of that *Urachus* marked R at F, in *Fig.* 162. The other *Urachus* lay about a quarter of an Inch laterally beyond that marked R in the ſame *Figure*. I mean by two *Urachus's*, two long roundiſh Bodies, of a depreſſed Figure, they ſeemed as big as a common knitting Needle, and were of a darker Subſtance than the *Placenta* on which they lay. They appeared in every reſpect like that Part of the *Navel-ſtring*, which is allowed by all Anatomiſts to be the *Urachus*, and in like manner ſhrunk in two or three Days, from a mucous Subſtance to a meer Membrane.

(*n*) Excercit. 24. de Gener. lib. 1. cap. 30, & 31.

(*o*) Parey, lib. 25. cap. 2.

(*p*) Diem.

Theſe two are the only entire *Urinary* Membranes that I have prepared. Yet in the many *Secundines* that have come to my Hands, I have ever found three diſtinct Membranes eaſily ſeparable.

From hence then we can better explain ſome *Phænomena*, as voiding *Urine* by the *Navel*, and the *Breaking of Waters* from Women half gone with Child, and tell the Conſequences of ſuch Accidents; as alſo better account for thoſe *Waters* and *Bladders* Midwives meet with, and direct them in their doubtful Operations, *&c.*

XL. *An Account of a Book Omitted.*

n. 270. p. 829. *Profluvia Ventris*, or the *Nature* and *Cauſes* of *Looſeneſſes* plainly diſcovered, their *Symptoms* and *Sorts* evidently ſettled, the *Maxims* for *curing* them fully demonſtrated, and all illuſtrated with the moſt remarkable *Methods* and *Medicines* of all Ages; and with ſome *practical Obſervations* concluding every Sort. By *William Cockburn*, M. D. late *Phyſician* of his Majeſty's Fleet, *F. R. S.* and of the *College* of *Phyſicians*. *London*, 1701, *8vo.*

CHAP.

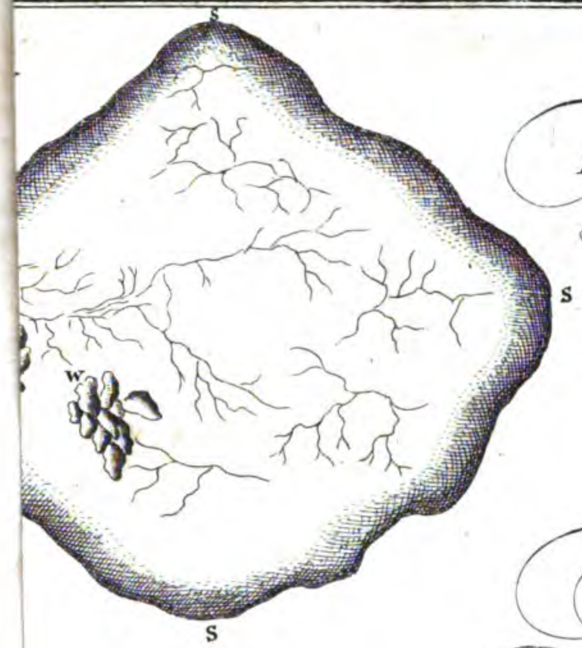


Fig. 160.

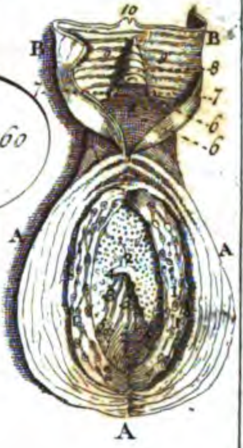
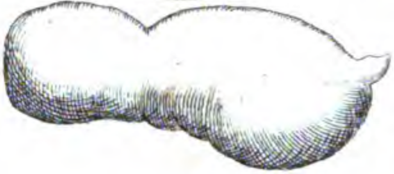


Fig. 158.



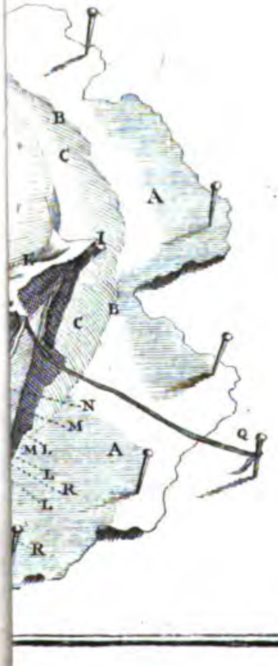
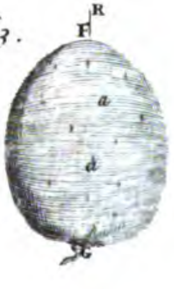


Fig. 163.



A Scale of Inches for Fig.^s 161, 162, 163.

CHAP. VI.

The Humours, and General Affections of the Body.

An Account of the Diſſection of Mr—Dove. *By Mr* W. Cowper. *n.* 335. *p.* 512.

I. THE Body of Mr *Dove* in divers Parts appeared of a black, blue, livid, and various Colours, before I made any Inciſion into it; particularly the Back (where the Blood was ſettled) had a cadaverous Blackneſs; where the *Cuticula* was here and there veſicated or diſtended with *Serum*; of this there was no appearance before Death.

The Muſcles of the *Abdomen* had a mortified Appearance, being of a blackiſh green Colour. The Liver was intirely ſphacelated. The Spleen had large mortified Spots on it's Surface: Both theſe Parts were ſpecifically lighter than in the natural State; inſomuch, that Portions of each of them ſwam on the Surface of Water, and ſeemed to have more Air in them than we commonly find in the Lungs in their natural State. The reſt of the *Viſcera* in this lower Cavity were not in ſo ill a State; though the Guts had here and there blackiſh Spots on them.

The Pectoral Muſcles were in a little better State than thoſe of the *Abdomen*; nor were the intercoſtal Muſcles like thoſe of the Limbs. I am apt to think all the Muſcles imployed in Reſpiration, had more or leſs of this blackiſh Appearance. The right Lobes of the Lungs were diſeaſed; and the ſame Side of the *Thorax* had a ſmall Quantity of *Serum* in it. The Lungs on the other Side were in no ill Condition. The *Heart* was very flaccid and large: The right *Ventricle* and *Vena Cava* had no ſmall *Polypus* in them. The *Vena Pulmonalis* was exceedingly dilated next the *Baſis* of the Heart. The left *Ventricle* of the Heart was furniſhed with a ſmall *Polypus*, and a great Quantity of grumous Blood. The great *Artery* was very thin, and appeared not a little extended, and had ſome cartilaginous Bodies interſperſed in it's Membranes.

In the Head; the *Dura Mater* was found inſeparable from the *Cranium* in it's upper Part. A *Polypus* was drawn out of the upper great Vein of the Brain, called *Sinus Falcis ſuperior*.

The *carotid* Arteries, were very thin, and much larger than they ought to be, before they entered the Subſtance of the Brain. In ſhort, all the Blood Veſſels which I examined were very much dilated, and ſeemed to be charged with as much Wind as Blood.

Experiments *relating to the* Specific Gravity *of Human* Blood; *by Dr* J. Jurin. *n.*361 *p.*1000.

II. It is well known from the Obſervations of Mr *Lewenhoeck* and others, that Human Blood conſiſts of red globular Particles ſwimming in a pellucid *Lympha* or *Serum*. Which two different Subſtances, tho' of unequal Specific Gravities, yet ſo long as they continued to circulate in the Veins and Arteries, are prevented from ſeparating by their Motion and Warmth. But when the Blood comes to ſtagnate and cool in the Porringer, the globular Particles uniting together by their attractive Power, and ſinking by their Weight, which is greater than that of the *Serum*, form the *Coagulum* or *Craſſamentum* at the Bottom of the Porringer, the *Serum* ſwimming above it.

Things always happen in this Manner when the *Craſſamentum* is at Liberty to ſubſide; but it often falls out, that neither by it's Adheſion to the Sides of the Veſſel, or by the Bubbles of Air which the Blood gathers upon falling into the Porringer, and which ſtick to it's Surface, the *Craſſamentum* is kept from ſinking, and ſeems to float upon the Top of the *Serum*.

Theſe Accidents ſeem to have given the firſt Occaſion to that Opinion, which has been generally entertained by thoſe who have writ upon this Subject, namely, that the globular Part of the Blood is ſpecifically lighter than the *Serum*, in which it ſwims.

But that, which has ſo fully eſtabliſhed this Perſuaſion, is the Authority of the late Mr *Boyle*, who, among the many Experiments he has given us in his Natural Hiſtory of Human Blood, has left the following ones upon this Subject.

The Specific Gravity of *Serum* of Human Blood was found by weighing a Piece of Sealing-Wax firſt in *Serum*, and afterwards in Water, to be to the Specific Gravity of Water, as 1024 to 1000.

In a ſecond Experiment, which for greater Accuracy was made with an Inſtrument contrived on Purpoſe, the ſpecific Gravity of *Serum* was found to be to that of Water, as 1194 to 1000.

In a third Experiment made by the ſame Inſtrument, and with *Serum* from the Blood of another Perſon, it's Specific Gravity appeared to be 1186.

The *Medium* between theſe two laſt Experiments is 1190, which has ſince been univerſally received for the Specific Gravity of *Serum* of Human Blood, the firſt Experiment being declared by Mr *Boyle* himſelf to be leſs exactly made than the other.

The Specific Gravity of Human Blood was found by Mr *Boyle*, to be to that of Water, as 1040 to 1000; tho' on Account of Difficulties by him mentioned, he was far from being ſatisfied with this Experiment, and recommended the Thing to farther Trials.

Theſe Experiments however having hitherto paſt uncontroverted, and it appearing from them, that the Specific Gravity of *Serum* was greater than that of Blood in the Proportion 1190 to 1040, or of 8 to 7 nearly; it was a neceſſary Conſequence of this, that the Blood

Globules were ſpecifically lighter than the *Serum*, and that in a very great Degree, conſidering the ſmall Proportion that the Bulk of the *Craſſamentum* was found to bear to that of the *Serum*, from other Experiments.

From this it was not improbably conjectured, that theſe Globules were thin Veſicles fill'd with an Aëreal Subſtance: And this Opinion ſeem'd to receive a great Confirmation, upon it's being obſerved, in viewing the Circulation by a Microſcope, that a Blood Globule, in paſſing thro' a very narrow Veſſel, would change it's Shape from a globular to an oval Form, and would recover it's former Figure, as ſoon as it was got thro' the narrow Paſſage; which Appearance ſeem'd to be naturally accounted for, from the Elaſticity of the included *Aura*.

Upon this Conjecture have been built a great many Solutions of the *Phænomena*, obſervable in the Animal Oeconomy, and the Diſorders of it, by eminent Authors, who were led into this Miſtake by the natural Conſequence of a Matter of Fact, for the Truth of which they had ſo great an Authority: But, that the *Red Globular* Part of the Blood is ſpecifically *heavier* than the *Serum*, will appear from the following Experiments.

Exp. I. I have ſeveral times cut off a ſmall Part of the *Craſſamentum*, when by it's Adheſion to the Sides of the Porringer, it has ſeem'd to ſwim upon the Surface of the *Serum*, and have put it into another Veſſel fill'd with *Serum*; upon which it has immediately ſunk to the Bottom.

Exp. II. When the *Coagulum* has been buoyed in the *Serum*, by the Bubbles of Air adhering to it's Surface, I have ſeparated a ſmall Part of it, where thoſe Bubbles have been thickeſt, and put it into a Glaſs of *Serum*, in which it has ſwam as before. Then ſetting the Glaſs upon the Air-Pump, thoſe Bubbles burſt after one another, as the Receiver was exhauſting; and the Air being again let into the Receiver, the Lump of *Craſſamentum* ſunk to the Bottom of the Glaſs.

Exp. III. I have often plac'd a Drop of *Serum* upon a clean Glaſs, before a Microſcope, in which I had diſſolv'd a very ſmall Quantity of Blood, and obſerv'd, that when the Glaſs was held in a perpendicular Poſture, the Blood-Globules ſubſided to the Bottom of the Drop; and inverting the Glaſs, the Globules again deſcended thro' the *Serum*, to the Bottom. I had the ſame Succeſs with a ſmall Quantity of *Serum* and Blood, in a Capillary Tube: And the ſame Thing has been long ſince obſerv'd by Mr *Lewenhoeck*.

Theſe Experiments undeniably demonſtrate, that the *Craſſamentum*, or Globular Part of the Blood, is ſpecifically heavier than the *Serum*; and conſequently it is by no means probable, that the Blood-Globules are Veſicles fill'd with Air, or any other Fluid, lighter than *Serum*. And that they are not fill'd with any Sort of Elaſtic Fluid, will appear from the following Experiment.

Exp. IV. In a ſmall Quantity of *Serum* of Human Blood, I diſſolv'd ſo much Blood, as that the Globules might not lie too thick together, to hinder their being ſeen diſtinctly. Then having lodged a ſmall Drop of this Liquor on the Inſide of a thin Glaſs Tube, I fitted the Tube on to the Air-Pump, and placed a Microſcope by it, ſo that I could ſee the Blood-Globules thro' the Tube. This being done, I caus'd the Tube to be exhauſted, keeping my Eye upon the Globules all the time, in order to obſerve whether they dilated themſelves, as the Air was withdrawn; but could not perceive the leaſt Alteration, they appearing exactly of the ſame Bigneſs in the *Vacuum*, as they had done before. Whereas if they had been fill'd with an Elaſtic Fluid, they would either have burſt, or have been dilated to at leaſt 70 or 80 times their former Magnitude. The Stop-Cock being afterwards turn'd, and the Air ſuffer'd to re-enter the Tube, the Blood-Globules ſtill retain'd the ſame Bigneſs, as in *Vacuo*.

Mr *Machin*, Profeſſor of *Aſtronomy* in *Greſham-College*, was preſent at a Repetition of this Experiment, and was fully ſatisfied upon repeated Trials, that there was no perceivable Difference between the Magnitude of the Blood-Globules in the Air, and in *Vacuo*. Upon this Occaſion the two firſt Experiments were likewiſe repeated in his Preſence, with the ſame Succeſs, as above related.

Tho' what has been already ſaid, is a ſufficient Proof of the Falſity of the Opinion above-mention'd, yet however to prevent the Objections which may ariſe for want of Experiments made in the ſame manner with Mr. *Boyle's*, as well as for the Satisfaction of the Curious, who may be deſirous to know the true Specifick Gravities of *Serum* and Blood, I ſhall proceed to demonſtrate the ſame thing by Hydroſtatical Experiments.

Exp. V. *Novemb.* 13, 1713. Having ſuffer'd a Quantity of my own Blood to ſtand about 24 Hours in the Porringer, and then drawing off the *Serum* carefully with a ſmall *Siphon*, into a convenient Glaſs, I found by the Hydroſtatical Balance, it's Specific Gravity to be to that of Water, as 1029,8 to 1000.

Exp. VI. *Feb.* 21, 1716-7. I examin'd the *Serum* from the Blood of another Perſon in the ſame manner, and found it's Specific Gravity to be 1028,6.

Exp. VII, VIII, and IX. *April* 8th, 1717. I obtain'd three ſeveral Quantities of *Serum* from the Blood of different Perſons. The firſt of theſe was of a deep Colour, inclining ſomething to red, and a little turbid. It's Specific Gravity was 1029,7.

The ſecond was likewiſe a little turbid, and of a pale whitiſh Colour. The Specific Gravity of this was 1030,2.

The third Quantity of *Serum* was perfectly clear, and of the Colour of *Canary*. It's Specific Gravity was found to be 1030.

Tho' theſe five ſeveral Experiments were all carefully made, and with a Balance whoſe Accuracy I was well aſſur'd of; yet for farther

Evidence, I thought it proper to make that which follows after another manner.

Exp. X. *Jan.* 15th, 1718-9, I drew off all the *Serum* from five or ſix ſeveral Porringers, containing the Blood of different Perſons. This I found to be a little tinged with Blood, which was occaſion'd by my being oblig'd to draw it off pretty near to the Bottom of the Porringers, in order to obtain a Quantity ſufficient for my Purpoſe. For this Reaſon, I ſuffer'd it to ſtand about two Days, in which Time the Globular Part of the Blood was entirely precipitated to the Bottom, and the *Serum* was become perfectly fine and tranſparent. I then drew it off with a *Siphon* into a Glaſs Vial with a narrow Neck, which I fill'd to a certain Mark made in the Neck for that Purpoſe. This done, I plac'd my Vial in a nice Pair of Scales, in which I had a Counterpoiſe for the Weight of the Vial, and found that Quantity of *Serum* to weigh 2284 ¼ Grains.

Then pouring out the *Serum*, I fill'd the Vial with common Water to the ſame Mark, and found the Weight of the Water to be 2219 Grains.

From which it follows, that the Specific Gravity of this *Serum* was 1029,4.

Exp. XI. *July* 14, 1719. I procur'd a Quantity of Blood taken from the temporal Artery, from which I drew off the *Serum* the next Day, and weighing it in the ſame manner, found it's Specific Gravity to be 1028,8.

Theſe Experiments agree ſo nearly together, that the little Difference between them may very well be attributed to that which is between the *Serum* of different Perſons; or to the Variations occaſion'd by Heat and Cold in the ſeveral Seaſons of the Year, in which they were made. So that from them we may ſafely determine the Specific Gravity of *Serum* of Human Blood, at a *Medium* to be 1029,5, or in a round Number 1030. From which the greateſt Variation in any of theſe Experiments, is little more than 1 in 1000; whereas the Difference between Mr *Boyle*'s Experiments and mine, amounts to 160 in 1000.

Exp. XII. *April* 6, 1717. In order to find the Specific Gravity of Human Blood, which, by Reaſon of it's Tenacity, and ſudden Alterations upon ſtanding, cannot be determin'd by the Hydroſtatical Balance; I took a narrow-neck'd Vial, and fill'd it to a Mark with Blood pour'd immediately out of the Porringer, as ſoon as the Perſon was blooded. This I weigh'd, as I had done the *Serum* before, and found it's Specific Gravity to be 1051.

Exp. XIII. *Aug.* 5th, 1717. Having fill'd the ſame Vial with the Blood of another Perſon, running immediately out of the Vein through a Funnel, it's Specific Gravity was determin'd at 1053.

Suffering this to ſtand 'till it was cold, I found the Blood was ſunk a ſmall Matter below the Mark in the Neck of the Vial. This being fill'd up with the Water, which in ſo ſmall a Quantity could make no ſenſible Difference from Blood, I found the Specific Gravity of cold Blood, to be 1055.

Exp. XIV. *Aug.* 6, 1718. The laſt Experiment being repeated in the ſame manner as the Year before, the Specific Gravity of cold Blood was again found to be 1055.

Exp. XV. *July* 14, 1719. The Arterial Blood, from which the *Serum* was afterwards drawn off for the 11th Experiment, being weigh'd in the ſame manner, it's Specific Gravity was 1052,5.

As this Arterial Blood and it's *Serum*, differ no more in Specific Gravity from Venal Blood and it's *Serum*, than the ſeveral Portions of theſe do from one another, 'tis plain, that the Difference in this reſpect between Arterial and Venal Blood, is wholly inconſiderable. The Animal Oeconomy indeed teaches us, that the *Serous* Liquor is perpetually drawing off from the Arterial Blood by the ſeveral Secretions, but as the Quantity ſeparated in one Circulation is very ſmall, the Blood muſt arrive in the Veins nearly of the ſame Denſity, as when it runs thro' the Arteries.

In the 13th Experiment, we obſerv'd that the Blood alter'd it's Specific Gravity upon cooling, from 1053, to 1055; from which we may infer, that if the Blood made uſe of in the 12th Experiment, had been ſuffer'd to ſtand 'till it was cold, it's Specific Gravity would have been 1053; wherefore, taking a *Medium* between the four laſt Experiments, we may allow the Specific Gravity of cold Human Blood, to be 1054.

The Difference of 14 Parts in 1000, between this and the Specific Gravity determined by Mr *Boyle*, is eaſily accounted for, if we conſider, that That Gentleman did not make uſe of a Veſſel with a narrow Neck, as plainly appears from the Circumſtances mentioned in his Experiment; and conſequently a ſmall Error in the Height of the Liquor, would make a conſiderable Alteration in the Specific Gravity.

Since therefore the Specific Gravity of Human Blood is 1054, and that of it's *Serum* 1030, it is plain, that Blood is heavier than *Serum* by about one Part in 43. From which it manifeſtly follows, that the globular Part of the Blood is ſpecifically heavier than the *Serum*, ſince the globular Part being ſeparated from the Blood, leaves the Remainder, or the *Serum*, ſpecifically lighter than the intire Maſs.

But in order to determine the exact Specific Gravity of the Blood-Globules, it is firſt neceſſary to know the Proportion which the whole Quantity of the *Craſſamentum* contained in Blood, bears to the *Serum*. To this End, Mr *Boyle* has given us two ſeveral Obſervations of the Weights of the *Craſſamentum* and *Serum*, after they have ſeparated one from another in the Porringer. But beſides the Difficulty of making this Experiment with any tolerable Exactneſs, it is to be conſider'd, that there is a great deal of *Serum* contain'd in the Interſtices of the Globules, that compoſe the *Craſſamentum*.

This Difficulty, however, is in ſome meaſure anſwer'd by two other Experiments, which Mr *Boyle* made for this Purpoſe, after the following manner. He put a Quantity of the *Craſſamentum*, already ſeparated from the *Serum*, into an Alembic, and diſtill'd off the remaining *Serum* to Dryneſs, but without drawing off the Oil, or Volatile Salt; after which, he weigh'd the diſtill'd Liquor, and the dry Maſs left behind.

By comparing theſe Experiments with the two former, it will be found, that the entire Weight of *Serum* contain'd in Blood, is nearly $\frac{13}{15}$ of the whole; and conſequently the Weight of the dry'd *Craſſamentum*, is only two Fifteenths of the Blood.

But for farther Satisfaction, an Analyſis was made at my Deſire, with a large Quantity of Blood, amounting to four Pounds fourteen Ounces, by a ſkilful Chymiſt, Mr *John Brown*.

From this was obtain'd, with a very gentle Heat, two Pounds fourteen Ounces, and ſix Drachms of a Phlegmatic Liquor, that had ſcarce any thing of the fœtid Scent which is uſual in the Diſtillation of Animal Subſtances; and it's Specific Gravity was nearly the ſame with that of common Water, being but 1000,8. This being mix'd with a ſtrong Solution of Alum, ſcarce afforded any *Coagulum*; but exhibited a conſiderable one, upon Mixture with a Solution of *Roman* Vitriol.

The Diſtillation being continued with the ſame Heat, we had ſeven Ounces more of Phlegm conſiderably impregnated with Volatile Salt, as was manifeſt from the Smell. The Specific Gravity of this was 1007, and having mix'd it with *Tinctura Martis optima*, Solution of Alum, and of *Roman* Vitriol, a large *Coagulum* was precipitated. In diſtilling theſe, there was loſt by Evaporation, two Ounces and two Drachms.

The third Portion of Liquor being rais'd with a ſtronger Fire, amounted to ſeven Ounces ſix Drachms. This was reddiſh, and turbid, and ſo ſtrongly charg'd with Volatile Salts, that it might very well deſerve the Name of Spirit. It's Specific Gravity was 1080,1.

Beſides theſe, we had ſeven Drachms of Volatile Salt, an Ounce of Oil, and eight Ounces four Drachms of *Caput Mortuum*, which ſtill retain'd ſome ſmall Remainder of the Oil, as was manifeſt from it's taking Fire at the Flame of a Candle. In this latter Part of the Operation, was loſt three Ounces, ſeven Drachms.

Upon making due Allowance for the Difference between the Specific Gravities of the three firſt Portions of Liquor, and that of *Serum*, as likewiſe for what was loſt in the two ſeveral Parts of the Operation, which we may reaſonable conclude to have been of a Specific Gravity nearly the ſame with that of the Liquor drawn off, it will be found, that the Quantity of *Serum* contain'd in this Maſs of Blood, was about $\frac{15}{17}$ of the whole Weight; and conſequently that the Quantity of *Craſſamentum* was $\frac{2}{17}$ of the ſame Weight.

If we calculate therefore upon this Suppoſition, that the Weight of the globular Part of the Blood is $\frac{2}{17}$ of the whole, we ſhall find the Specific Gravity of a Blood-Globule, to be to that of Water, as 1277 to 1000.

If we follow the Proportion of $\frac{2}{15}$, which reſults from Mr *Boyle*'s Experiments, the Specific Gravity of a Blood-Globule will be 1242.

But this Computation is in all Appearance a great deal too large; for we cannot be aſſur'd, that our whole Quantity of aqueous Liquor was rais'd from the *Serum* of the Blood. On the contrary, it is more than probable, that a conſiderable Part of it was afforded by the Blood-Globules themſelves, eſpecially in the latter Part of the Operation, when their Texture muſt of Neceſſity have been broken and diſſolv'd by the ſtrong Fire that was made uſe of. To prove this, we need only to conſider the Condition of the dry'd *Craſſamentum*, after the Phlegm is drawn off, that being now a hard and brittle Subſtance; whereas the Globules in their natural State, are ſoft and yielding. For which Reaſons it may perhaps be more ſatisfactory, if we attempt to find the Quantity of the globular Part of the Blood after another manner.

It appears therefore from Mr *Boyle*'s Obſervations, that the Quantity of *Serum*, which may be pour'd off from the *Craſſamentum*, is about one Half of the whole Maſs. The remaining *Craſſamentum* conſiſts of the Blood-Globules, and a Quantity of *Serum* filling up the Interſtices between them; which if the Globules keep their Spherical Form, may eaſily be found by the Principles of common *Geometry*, to be nearly one Half of the Bulk of the *Craſſamentum*; but if the Globules by their Preſſure againſt one another change their Figure, the Quantity of *Serum* will be ſomething leſs.

If this Quantity of *Serum* lying between the Blood-Globules be added to that pour'd off, it appears, that the *Serum* contain'd in Blood, is about $\frac{3}{4}$ of the whole Bulk, and conſequently that the Blood Globules make about $\frac{1}{4}$ of the whole. From which we ſhall find the Specific Gravity of the Blood-Globules to be to that of Water, as 1126 to 1000.

If we ſuppoſe the Blood-Globules to make $\frac{1}{6}$, $\frac{1}{5}$, $\frac{1}{3}$, or $\frac{1}{2}$, of the whole Bulk, their Specific Gravity will be reſpectively 1174, 1150, 1102, or 1078. So that upon any of theſe Suppoſitions, the Specific Gravity of the Blood-Globules will be conſiderably greater than that of the *Serum*, and conſequently they cannot be ſuppos'd to be Veſicles fill'd with an Aëreal Subſtance.

It will therefore perhaps be aſk'd, What they do really conſiſt of?

In order to come to a Solution of this Queſtion, it may be proper to take Notice.

That Blood is compos'd of Phlegm, Oil, volatile and fix'd Salts, and Earth. For as to the Spirit, we look upon it with Mr *Boyle*, to conſiſt of the Phlegm and Volatile Salt united together.

That the *Serum*, upon a Chymical Analyſis, exhibits a great deal of the firſt of theſe, and the others in a very ſmall Quantity.

That on the contrary, the *Craſſamentum* yields much leſs Phlegm, but the other Principles much more copiouſly than the *Serum*.

From which *Data*, I think, we may ſafely conclude, that the *Craſſamentum*, or Globular Part of the Blood, conſiſts of ſome Phlegm united with the Oil and Salts, and a ſmall Quantity of Earth.

But what is the exact Proportion of theſe ſeveral Principles to one another; what Alterations are produced in the Body by a Change of this Proportion; how, and in what Part theſe Globules are form'd; by what means they preſerve their Figure, without diſſolving in the *Serum*, or uniting with one another; what Variations are made in their Specific Gravities by Heat and Cold; and what are the Effects of thoſe Variations, are Queſtions not very eaſy to be ſolv'd, and yet of ſo much Importance to the Animal Oeconomy, that it were greatly to be wiſh'd, we had a Number of *Data* ſufficient to determine them.

I have ſince made the following Experiments, which ſerve to confirm the Method laſt made uſe of, for finding the Specific Gravity of the Blood-Globules.

Auguſt 6, 1719. I took a Lump of the *Craſſamentum* and waſh'd it gently in fair Water, to free it from the looſe Globules, which precipitating out of the *Serum*, after the *Coagulum* is form'd, do not unite into one Body with it. This done, I laid it on a ſpongy brown Paper, in order to drain off the ſuperfluous Moiſture. After which, weighing it firſt in Air, and then in Water, I found it's Specific Gravity to be 1083 $\frac{1}{2}$.

Another Lump of the ſame *Craſſamentum* being weigh'd in the ſame manner, it's Specific Gravity was 1082,9.

Sept. 18, 1719. I found the Specific Gravity of another Piece of *Craſſamentum* to be 1082,1.

A ſecond Piece from the Blood of a different Perſon, gave me 1086,1.

A third from the ſame Perſon, gave 1086,6.

From this it follows, that the Specific Gravity of the Blood-Globules is at leaſt 1084, which is the *Medium* between theſe five Experiments.

But if we allow one Half of the Bulk of the *Craſſamentum* to conſiſt of *Serum*, filling up the Spaces between the Blood-Globules, we ſhall find their Specific Gravity to be 1138.

From this we muſt make a ſmall Abatement, becauſe ſome Part of the *Serum* muſt have been ſqueez'd out from between the Globules, by their yielding to one another's Preſſure, when the Lump of *Craſſamentum* lay upon the Paper: And this will reduce their Specific Gravity ſufficiently, near to 1126, as we had before determin'd it.

The Figures *of the* Arteries *and* Veins *explained. With ſeveral* Anatomical *and* Chirurgical *Obſervation, by Mr* W. Cowper. *n.* 280. *p.* 1177.

III. The Schemes of the Arteries and Veins (*Fig.* 164, 165, 166,) were drawn after the Veſſels themſelves, paſted and dry'd, which were diſſected from *Adult Human Bodies*, and diſplay'd on *Tables* in the *Repoſitory* of the *Royal Society*, and are the Preſent of *John Evelyn*, Eſq; from whom I receiv'd the following Account, concerning them, and another *Table* of the *Nerves*, &c.

An Account of theſe Preparations; *by Mr* J. Evelyn.

Being ſome Years ſince in Italy, *and curious of ſeeing the many repeated Diſſections at the Anatomical Theatre at* Padua, Cavalier Veſtlingius *being then Profeſſor, and reading on divers Bodies ſeveral Days, during the* Lent, *Dr* Johanno Athelſteinus Leoncenæ, *who was then* Operator, *by extracting the Veins, and other Veſſels, which contain the* Blood, Spirits, *&c. out of Human Bodies, began to apply, and diſtend them on* Tables, *according to their natural Proportion and Poſition. Some of theſe* Tables *being finiſh'd with the Direction and public Approbation of the Profeſſor, and ſeveral other Learned Phyſicians and Anatomiſts, preſent at thoſe Lectures, and Operations; and underſtanding that* Leoncenæ *was going ſhortly (I think) into* Poland, *and willing to diſpoſe of his Tables before he took his Journey, I deſir'd the late Dr* Geo. Rogers, (Conſul *then at* Padua, *for the Students of our Nation in that Univerſity) to purchaſe, and procure them for me; which he did, for, as I remember,* 150 Scudi; *with Condition, that he ſhould add a* Table *more, namely, that of the* Liver, Gaſtrick Nerves, *and other Veſſels, to compleat the fourth.*

Fig. 164.

Fig. 165.

I find the *Arteries* here, very agreeable to a Figure which I drew and publiſhed not long ſince, from the *Arteries* of a *Fœtus* injected with Wax. But this Figure of the *Veins* differs ſo much from any extant, as would incline one to ſuſpect all of the Subject hitherto publiſh'd, are fictitious, not excepting even thoſe of *Veſalius*. But firſt of the *Arteries*.

That the *Arteries* are the Veſſels which convey Blood from the *Heart*, to all Parts of the Body, is well known; and we ſee by *Fig.* 164, that the common Practice of Nature, in diſtributing theſe Veſſels, to ſupply the Parts with Blood, is from the next adjacent Trunk, 'till their aſcending and deſcending Trunks become Conical, as well as their collateral Branches: Not that all the Trunks and Ramifications of *Arteries* are uniform; and become Conical in the ſame manner; nor do all of *Them* paſs directly to the Parts to which *They* convey Blood; nor do all Parts receive *Arteries* from their neighbouring Trunks.

The Trunks of the *Carotid*, *Vertebral*, and *Splenic Arteries*, are not only *Contorted* in their Progreſs, in the *Adult*; but the Diameters of their Bores are variouſly *dilated* in divers Parts of *Them*, eſpecially where *They* are *Contorted*; but as theſe Dilatations of their Trunks are caus'd by the Reſiſtance the Blood meets with at thoſe *Angles of Inflection*; ſo thoſe *Enlargements* of them afterwards, contribute to retard the Protruſion of the Blood to the Extremities of thoſe *Arteries*: Hence it is, That as the *Arteries* of the *Fœtus* are not *Contorted* in ſuch acute Angles as in full grown Bodies; ſo their Trunks are more Conical, and not here and there dilated in divers Parts of them, as in the *Adult.*

The Trunk of the *Splenic Artery* has a ſtraight Progreſs in the *Fœtus* and in *Infants*; but in the *Adult* I have conſtantly found it very much *contorted*, as expreſſed in *Fig.* 164, 23.

Spermatic Arteries.

The peculiar Contrivances of the *Spermatic Arteries* of *Quadrupeds* as well as *Men*, ſhew a conſtant Deſign in Nature of taking off that Velocity with which the Blood would otherwiſe paſs thro' the *Glands* of the *Teſtes*: It ſeems to be for this End that the *Teſtes* of moſt Animals (eſpecially *Men* and *Quadrupeds*) hang out of the Cavities of their *Abdomen*, that the Canals of their Blood-Veſſels may be lengthen'd: For the *Spermatic Arteries* (contrary to all others) ariſe from the great Trunk, at a far greater Diſtance from the *Teſtes* than the *Arteries* of any other Part of the Body. Nor would the *Teſtes* (which are ſuch neceſſary Organs) have been thus expoſed to external Injuries, if the End of Nature in lengthening their Blood-Veſſels had not been very conſiderable. Beſides this Lengthening of the *Spermatic Arteries*, we find Nature ſtill contriving other Impediments to *check* the Current of the Blood in thoſe Parts; it ſeems for this End that the *Spermatic Arteries* are leſſened at their Original from the Trunk of the *Arteria Magna* in *Men*, and that the *Spermatic Arteries* of *Quadrupeds* are ſo much *contorted* before they reach their *Teſtes.*

The principal Inducement of Nature in making uſe of theſe different Contrivances in the *Spermatic Arteries* of *Men* and *Quadrupeds*, ſeems to be,

That, if the *Human Spermatic Arteries* were *contorted* as in *Quadrupeds*, before they reach their *Teſtes*, the Apertures in the *abdominal Muſcles* of *Man* muſt be much larger than they now are, and would frequently let the *Inteſtines* deſcend into the *Scrotum*; which nevertheleſs often happens: Such *Ruptures* (as they are called) are not ſo incident to *Quadrupeds*, tho' the Paſſages for their *Spermatick* Veſſels (thro' their *abdominal Muſcles*) are much wider than in *Men*, becauſe the Poſition of the Trunks of their Bodies is *Horizontal*, and their *Inteſtines* therefore cannot preſs on the Proceſſes of the *Peritonæum*, as in *Men* who are *erect.*

I ſhall now proceed to deſcribe the Extremities of the *Arteries*, with their *Communications* with the *Veins*, and afterwards produce ſome Inſtances of the Art of Nature in conveying the refluent Blood to the *Heart.*

Of the Communications *of the* Extremities *of the* Arteries *with the* Veins, &c.

After the *Circulation of the Blood* thro' the Heart, Lungs, and large Blood-Veſſels, was demonſtrated by Dr *Harvey*, it was only gueſſed how the Extremities of the *Arteries* tranſmitted the Blood to the *Veins*, till Mr *Lewenhoeck*'s *Microſcopes* had diſcovered the Continuations of the Extremities of thoſe Veſſels in *Fiſhes*, *Frogs*, &c. which is now commonly ſhewn by *Microſcopes* made by other *Hands*: Yet ſome doubt of the like Continuations of the Extremities of *Arteries* and *Veins* in *Human Bodies* and *Quadrupeds:* ſince thoſe *Animals* it has hitherto been ſeen in (to any Satisfaction as Mr *Lewenboeck* confeſſes) have been either ſuch *Fiſh*, or of the *amphibious Kind*, that have but *one Ventricle* in their Hearts, and their Blood actually cold, except in Bats, in which it appears very obſcurely: Add to this, that the Blood in thoſe Creatures does not circulate with ſuch Rapidity as in *Animals* whoſe Hearts have *two Ventricles.* For in all Animals, that have *Biventrous Hearts*, the Veſſels of the reſt of the Body return their Blood to the Heart in equal Time and Quantity with thoſe of the Lungs, notwithſtanding the Inequality of their Courſe.

The Circulation *of the* Blood *ſeen in the* Omentum *of a* Cat.

* This Difference in the principal Organs of the *Circulation of the Blood* in thoſe Creatures, (on which only theſe *Experiments* have been hitherto made) moved me to make ſome on *Animals* whoſe Organs differ only from the *Human* in their groſs Figure, and not in their intimate Structure: For this End I took a young *Cat*, about ten or twelve Days old, and faſtened it to a Board as in Viveſection; and making an Inciſion thro' the *Linea Alba*, the *Omentum* and Inteſtines were extruded; then cauſing the Creature to be ſo held (on the Board) under a large *double Microſcope*, where a flat Glaſs for receiving of Objects was placed Horizontally, on which I expanded the *Omentum* or Caul, (a Light being placed underneath) I ſaw the Globules of the Blood move very ſwiftly in the ſmall Veſſels, which are only to be ſeen in the moſt tranſparent Parts of the *Membranes* of it's *Omentum*; but the Motion of the Blood ſoon abated, and it's Globules were withdrawn from the Extremities of it's Blood-Veſſels; and in a little time became ſtagnant in their larger Branches.

Fig. 169.

This Appearance of the Continuation of the Extremities of the *Arteries* with the *Veins*, while the Blood was moving in them, in the *Omentum* or Caul, is expreſſed by *Fig.* 169. A, A, ſhews the Trunks of the *Arteries.* B, B, the *Veins*, which were diſtinguiſhable by contrary Currents of the Globules of the Blood in each Veſſel. C, C, C, ſhews the Branching of the Extremities of the *Arteries* and *Veins*, that no longer aſſociate with each other, but are united, as here expreſſed.

—*In a* Dog.
Fig. 170.

I had once a young lean Dog, that was not large; in whoſe *Omentum* I ſaw it very well; but by the Aſſiſtance of an Inſtrument I had prepared to expand the *Meſentery*, I ſaw it there much better; that Part having not only larger and clearer Spaces than the *Omentum*, but it's

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* *Mr* Wotton *in his* Reflections upon Antient and Modern Learning, *Chap.* 18. *Since it has been conſtantly found, that Nature follows like Methods in all Sorts of Animals, where ſhe uſes the ſame Inſtruments, it will always be believed, that the Blood circulates in Men after the ſame Manner as it does in* Eels, Perches, Bats, *and ſome other Creatures, in which Monſieur* Lewenhoeck *tried it. Tho' the Ways how it may be viſible to the Eye in Men, have not, that I know of, been yet diſcovered.*

Blood-Veſſels are diſtributed more regularly, as appears by *Fig.* 170. where the ſame Letters of Reference ſerve as above.

Thoſe who would view the tranſparent Parts of living Creatures with *Microſcopes*, will find that the Extremities of their *Arteries* and *Veins* are not all equally leſſen'd though united. In the Trail of the *Lacerta Aquatica*, *Tadpoles*, and in moſt Fiſh (I have examin'd) I have frequently obſerv'd ſeveral Communications between the *Arteries* and *Veins*, in which more than two Globules of Blood have paſt abreaſt: And in the ſame *Area* I have ſeen ſome of thoſe *Communications* ſo ſmall, as that but one Globule could paſs, and that very ſlowly before the other. In young *Fiſh*, particularly in Grigs, I have frequently obſerv'd a *communicant Branch*, ſo very ſmall as that one Globule of Blood only has paſs'd it in two or three Seconds of a Minute: At other Times I have found conſiderable Intervals in paſſing of one Globule in ſuch a *communicant Branch*; even half a Minute, a whole Minute, and once in two or three Minutes I have ſeen one Globule of Blood only paſs in a particular Tract. — *in* Tadpoles, *&c.*

The prompt paſſing of Liquors, injected by the *Splenic Arteries*, to the *Veins*, ſhews the Communications between thoſe Veſſels are more open than the *Arteries* and *Veins* of other Parts. *Vid.* Supra, *p.* 227.

Liquors alſo injected into the *Pulmonic Arteries* paſs to their *Veins*, tho' not altogether ſo freely as in the *Spleen*.

On viewing the Extremities of the *Pulmonic* Blood-Veſſels in a living Frog with my *Microſcope*, I found their *Communications* much larger than *thoſe* that I had before ſeen in the Membrane between the Toes and in the Feet of the ſame Creature. Nor can we reaſonably doubt of the like patent Communications of the *Arteries* and *Veins* of *Human Lungs*, and thoſe of *Quadrupeds*, when we conſider the *Blood* of their Lungs muſt return to the Heart in equal *Time* and *Quantity*, with *that* of all the Parts of the Body beſides. Hence it appears that the *Bronchial Blood-Veſſels*, (firſt taken Notice of by the accurate *Ruyſch*) are abſolutely neceſſary, elſe the Parts of the Lungs could not receive Nouriſhment; nor could the Glands of the *Bronchiæ* ſeparate their Liquor, if they were ſupplied with *Blood* from the *Pulmonic* Blood-Veſſels *which* is ſo quickly diſpatched through the Lungs. — *in a* Frog.

On viewing the Membrane, that is, between the Toes of one of the hinder Feet of a living Frog, after I had frequently taken hold of the ſame Leg of that Creature, to apply it to the Microſcope, I found that Membrane very tranſparent, and without any Motion of the Globules of the Blood in it, as if the Part had been dead; but while I was looking on it, I ſaw the Globules creep into it by Degrees, and at length the Blood move in all the Branches of it's *Veins* and *Arteries* as before, when no Violence had been offer'd to the Part. While the Blood is thus leiſurely creeping thro' the Veſſels, you may

plainly

plainly ſee it's Globules compreſs'd into oval Figures, which are made more or leſs oblong, by the Reſiſtance thoſe Globules meet with, by the Contraction of the Sides of the Veſſels they paſs through; and this I have more than once obſerved in the Tails of the Water *Newts* or *Lizards*: But on examining the Blood of theſe Creatures with a Microſcope, and comparing it with the human Blood, I found the Globules of the *Lizards* Blood more incline to an oval Figure, and were as big again as the Globules of human Blood, and that of a ſmall Fiſh; which I in like manner viewed at the ſame Time. It is not unlikely a ſudden Retroceſſion of Blood from the Extremities of it's Veſſels often happens, and it's *Circulation* in the ſame Veſſels, is afterwards carried on without any Impediment; as on ſome Paſſions of the Mind, Deliquiums by the Effuſion of Blood, or otherwiſe. But if the Blood is once become ſtagnant in it's Veſſels (eſpecially the *Arteries*) the Part is in no ſmall Danger of a Mortification, unleſs it's neighbouring Veſſels, which enjoy the Motion of the Blood, drive on the ſtagnant Blood, and it eſcape by the Sides of the Veſſels that retain'd it. Experience aſſures us, that in Bruiſes when the Blood is extravaſated, it goes off either by *Tranſcolation* or elſe cauſes an *Abſceſs*; for there's little Reaſon to ſuſpect any of the ſtagnant Globules of the Blood will be fit to re-unite with the *circulating* Maſs. But that the Blood after Stagnation in it's Veſſels will ſometimes paſs their Sides, appeared to me from the following Experiment.

On viewing the *Meſentery* of a Dog when living, in which I had before ſeen the Blood paſſing the Extremities of the *Arteries* and *Veins*, I conſider'd how to preſerve the Blood in it's Veſſels, that I might afterwards at any Time ſee it in their Extremities when ſtagnant: For this End I caus'd ſeveral Parts of the *Meſentery* to be tied on as many Pieces of ſmall round *Pill-Boxes*, cut tranſverſely like little Hoops; on which, *Portions* of the *Meſentery* were extended like the Head of a *Drum*; and on viewing *them* afterwards with my *Microſcope*, I found the Extremities and Branches of the Blood-Veſſels charged with Blood, which before appeared in Motion. On laying one of theſe *Parts* of the *Meſentery* (thus expanded) in Water, the ſtagnant Blood in it's Veſſels diſappear'd; but on juſt immerſing another of thoſe *Pieces* in Water, I could with my naked Eye ſee the ſtagnant Blood diffuſed in the Interſtices of the Blood-Veſſels, and between the Membranes of the *Meſentery*: Hence it is evident, the Blood may paſs the Sides of it's *Veſſels* after Stagnation in *them*; but whether it's *Globules* are broken, or what Figure renders *them* fit to paſs thoſe Pores that are in the Sides of the Veſſels, I leave to others. But to return to our *Tables*, and firſt of that of the *Syſtem* of the *Vena Cava*.

Remarks on the Veins.

As the *Arteries* are known to export the Blood, ſo the *Veins* carry it back again to the *Heart*; but having already deſcribed their Extremities, we come next to the large Trunks of the *Veins*; and here, as in the *Arteries*, we find the common Practice of *Nature*, in diſpoſing the Branches of *Veins* to diſcharge the refluent Blood into the next adjacent Trunk, and ſo on to the Heart. As the *Arteries* afford abundance of Inſtances of *Checks* given to the Velocity of the Current of the *Blood* through ſeveral Parts, ſo the *Veins* ſupply us with as many *Artifices* to aſſiſt it's regular Return to the *Heart*, as well as favour thoſe *Contrivances* in the *Arteries*.

The Trunks of the *Carotid*, *Vertebral*, and *Splenic Arteries*, are not only variouſly contorted, but are alſo here and there *dilated*; ſo the *Veins* that correſpond to thoſe *Arteries* are alſo variouſly *dilated*. The Beginnings of the Internal *Jugulars* have a *bulbous* Cavity, (*Fig.* 171. H, H,) which are *Diverticuli* to the Refluent Blood in the *Sinus's* of the *Dura Mater*, leſt it ſhould deſcend too faſt into the Jugulars. Fig. 171. The like has been alſo taken Notice of by Dr *Lower* in the *Vertebral Sinus's*. The *Splenic Vein* has divers *Cells* opening into it near it's Extremities in Human Bodies; but in Quadrupeds the *Cells* open into the Trunks of their *Splenic* Veins.

The *Spermatic* Veins do more than equal the Length of the *Arteries* of the *Teſtes* in *Men*; their various *Diviſions* and ſeveral *Inoſculations* and their Valves, are admirably contrived to ſuſpend the Weight of the Blood, in order to diſcharge it into the larger Trunks of the *Veins*; and were it not that the Refluent Blood from the *Teſtes* is a *Pondus* to the Influent Blood from the *Arteries*, and ſtill leſſens it's Current in the *Teſtes*, theſe Spermatic Veins, like *thoſe* of other Parts, might have diſcharged their Blood into the next adjacent Trunk.

Who can avoid Surprize at the Art of Nature, in contriving the *Veins* that bring Part of the Refluent Blood from the lower Parts of the Body? When they conſider the Neceſſity of placing the Human Heart, as well as that of moſt Quadrupeds, ſo far from the *Centre* of the Body towards it's upper Part? It is for that End neceſſary † the large Trunks of the *Veins* and *Arteries* ſhould not aſſociate each other; for if all the Blood ſent to the lower Parts, by the deſcending Trunk of the *Aorta*, ſhould return to the Heart again by one ſingle Trunk (as it is ſent out from thence) the *Weight* of ſo much Blood in the Aſcending Trunk of the *Vena Cava*, (*Fig.* 165. C, C, A.) Fig. 165. would oppoſe the Force the Heart could give it from the *Arteries*, and hinder it's Aſcent: For this Reaſon the *Vena Azygos* (*b*) or *ſine pari*, is contrived to convey the Blood ſent to the Muſcles of the Back and *Thorax* into the deſcending Trunk of the *Vena Cava* (B, A,) above the Heart: Hence, it is evident, more Blood comes into the Heart by the deſcending or upper Trunk of the *Vena Cava*, B, A, than paſſes out by the aſcending Trunks of the *Aorta*. Nor does this

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† *Vid.* Lower de Corde, *cap.* 1. *pag.* 1.

Quantity of Blood, convey'd to the Heart by the *Superior Trunk* of the *Cava*, ſeem without ſome other Deſign in Nature, beſides tranſporting it thither to free the *Inferior Trunk* from it's Weight: But perhaps it was neceſſary ſo much Blood ſhould be ready there to join with the Chyle, for it's better Mixture, before it reaches the right Auricle of the Heart.

I have lately diſcovered a *peculiar Valve* in the *lower Trunk* of the *Vena Cava*, near the right Auricle of the Heart.

Fig. 164. *Fig.* 164, repreſents the Trunks and large Branches of the *Arteries* diſſected from an *adult Human Body*, when diſplayed and dried.

1, The Trunk of the *Aorta* cut from the *Baſis* of the *Heart.* 2, That Part of it, whence the *Coronary Artery* of the *Heart* does ariſe. 3, That Part of the *Arteria Magna*, where the *Canalis Arterioſus* of the *Fœtus* terminates; which in an *Adult* becomes a *Ligament.* (Vid. *Fig.* 167. 3.) 4, 4, That Part of the *Axillary Arteries*, by ſome called the *Subclavian Arteries.* 5, The Left *Carotid Artery* (in this Subject it ſeems) ariſing from a common Trunk with the Right *Carotid* and *Axillary Arteries*, as in ſome Quadrupeds. 6, The Left *Cervical* Artery, in this Subject ariſing from the Trunk of the *Arteria Magna*, as expreſſed in a Figure given by *Bergerus* in the *Acta Eruditorum*, *An.* 1698, *pag.* 295. But in all the Human Bodies in which I have hitherto examined theſe *Arteries*, I have conſtantly found *them* as expreſſed *Fig.* 165. 6, 6. 7, The Arteries that carry Blood to the lower Parts of the *Face*, *Tongue*, adjacent *Muſcles* and *Glands.* 8, The Trunk of the *Temporal* Artery, ſpringing from the *Carotid*, and parting with Branches to the *Parotid Gland*, 9, and *Temples* 10, and Parts adjacent. 11, The *Occipital Arteries.* 12, The *Arteries* that convey the Blood to the *Fauces*, *Gargareon*, and adjacent *Muſcles.* 13, The Trunk of the *Carotid Artery* cut off, before it is *contorted* in paſſing the Skull. 14, The Trunk of the *Artery* of the Arm parting with Branches to the adjacent Muſcles and Parts.

—Of an Aneuriſma. * That Part of this *Artery* which is ſometimes pricked in letting Blood, and makes an *Aneuriſma*, in which Caſe this Trunk of the Artery muſt be bared and *firmly tied above the Aneuriſma*; and if it afterwards happens (as it has been frequently known) that the Flux of Blood to the *Aneuriſma* in the *Artery* is not very much abated, though the *Artery* has been *tied above*; the *Operator*, in that Caſe, muſt make another Ligature on the Trunk of the *Artery*, *below* it's *Aneuriſma:* Theſe collateral Communications of the Trunk of the Artery at the bending of the Cubit, preſerve the Circulation of the Blood in the Cubit and Hand, though the *Trunk* is totally compreſſed both above and below; and the ſame *Trunk*, afterwards, divided between thoſe Ligatures. Hence it is, if one

Ligature made above the Wound in the Artery is not ſufficient, but the Blood ſtill pours out from below, the *Patient* will ſooner recover the Action and Strength of the Muſcles of the Cubit, than thoſe in whom the upper Ligature proves ſufficient; the reaſon of which is obvious to any, who conſider that the *Communicant Branches* muſt be larger where the lower Ligature is required, than when the ſuperior Ligature only is ſufficient: Theſe *Communicant Branches* (as I have ſeen them in ſome Subjects) are here marked out in prick'd Lines: *vid.* the *Fig.*

The two following Inſtances have lately happened, in which the *Communications* of the large Trunks of the *Arteries* of the Cubit and Arm were remarkable.

Two Caſes of an Aneuriſma. Fig. 164.

A *Boy* of thirteen Years, who, about three Weeks before I ſaw him, received a Wound near the Middle of the *Cubit* in which the *Trunk* of the *Artery* (marked in the *Fig.* †) was divided. The *Surgeon* who was firſt called, had frequently bound up the Wound, and put a Stop to the ſeveral Diſcharges of Blood (which, they told me, did not amount to leſs than ſix or ſeven Quarts, at times), but not without a Compreſs on the Trunk of the Artery, above the Wound. On another impetuous Flux I was called; but ſeeing no ſmall Quantity of Blood diſcharged, I was contented to let the Wound be bound up, in the ſame manner as it had been done before; omitting the Compreſs on the Trunk of the *Artery* above, and adding a Piece of Deal-Board, on which the Hand and Cubit were faſtened, to prevent any Motions of thoſe Parts, as well as the Fingers: Three Days after, the Applications were taken off, and little or no Blood appeared; but two or three Hours were ſcarce elapſed, e'er I was alarmed with Notice of a freſh Flux. The *By-ſtanders* being inſtructed in that Caſe, to compreſs the *Trunk* of the *Artery* above the *Cubit*, *they* had thereby prevented no ſmall Effuſion of Blood, which muſt otherwiſe have happened. I laid the Trunk of the Artery bare above the Wound as expeditiouſly as I could, being forced more than once to let looſe the Compreſs above, to diſcover it's Orifice by the Flux of Blood. I paſſed a Needle with ſtrong waxed Thread under the Artery, and made a Ligature on it's Trunk, which lay concealed in the Interſtice of the *Muſculus Flexor Digitorum*, and the *Muſculus Ulnaris Flexor Carpi*; but notwithſtanding this Ligature on the Trunk of the Artery above the Wound, the Blood ſtill flowed from the *Lower Trunk* of the *Divided Artery*; yet the Velocity of it's Current was ſo much abated, that it ſeemed like Blood flowing from a Vein. I left the Wound with a Digeſtive, and the Part without hard Bandage; it being now five Weeks ſince, I hear the Wound is almoſt *cicatriz'd* Dr *Harris* was preſent at the other *Operation*, by which the *Communications* of the large Trunks of the Arteries of the Arm were very evident.

Fig. 164.

A *Boy* about eight Years of age came to Town with an *Aneuriſma* of the left Arm, upon bleeding ſix Weeks before: The *Tumour* was indeed very large, in Proportion to ſo ſmall an Arm. After laying the *Aneuriſma* or *Tumour* bare, and making a Ligature on the *Superior* Trunk of the *Artery* (in the annexed *Fig.* * . . . . .) I found, on looſening the *Compreſs* on the Superior Trunk of the Artery, very little Abatement of the *Pulſation* of the *Aneuriſma*; I then paſſed a Ligature in like manner on the Trunk of the Artery below the Tumour; but notwithſtanding, the *Pulſation* continued, though much abated. I then diſcovered another Trunk of the *Artery*, ariſing from the lower Part of the *Tumour*, on which alſo I made another Ligature, and the Pulſation was then taken off. However, on cutting off the Surface of the *Cyſtis* or dilated *Artery*, and clearing it of the coagulated Blood, there ſtill poured out ſome freſh Blood, which was ſoon ſtopped with a common Aſtringent; I left the Part without any other Ligature or hard Bandage. It is now eighteen Days ſince the Operation, the Ligatures on the Arteries are all come off, and the *Pulſation* of the *Artery* of the *Wriſt* begins to be very manifeſt; nor does any Symptom appear that threatens Succeſs.

N, 285. *p*. 1391. [This Patient has ſince recovered the Uſe of his Arm, and is in perfect Health.]

15, The Diviſion of the *Trunk* of the *Artery* of the *Arm* below the Flexure at the Cubit. 16, The *external Artery* of the *Cubit*, which makes the *Pulſe*, that is commonly felt near the *Carpus*. 17, The *Arteries* of the *Hand* and *Fingers*. 18, The *Mammary Artery*. 19, 19, The *deſcending Trunk* of the *Arteria Magna*. 20, 20, The *Intercoſtal Arteries*. 21, The *Arteria Cæliaca*. 22, The *Arteria Hepatica*. 23, The *Trunk* of the *Arteria Splenica*. 24, The *Arteria Epiploica Siniſtra*. 25, A Branch of an *Artery* which paſſes to the Bottom of the *Stomach*. 26, The Superior *Coronary* Branch of the *Stomach*. 27, 27, The Superior *Meſenteric* Artery. 28, 28, The *Emulgent* Arteries. 29, The Inferior *Meſenteric* Artery. 30, 30, The *Lumbal* Arteries. 31, 31, The two *Spermatic* Arteries, which in this Subject ſeem to ariſe at a greater Diſtance from each other than commonly. 32, The *Iliac* Artery. 33, The *Arteria Sacra*. 34, The *Internal Iliac* Branch. 35, The *External* ———. 36, The *Epigaſtric* Artery. 37, Branches of the *External Iliac* Artery, paſſing to the Oblique *Muſcles* of the *Abdomen*. 38, 38, The Arteries that paſs to the *Muſcles* of the *Thigh* and *Tibia*. 39, The *Crural* Artery. 40, The *Umbilical* Artery, with thoſe of the *Penis*. 41, That Part of the *Crural* Trunk that paſſes the *Ham*. 42, The three *Trunks* of the Arteries of the *Leg*. 43, The Arteries of the *Foot* and *Toes*.

Fig. 167. *Fig*. 167. The *Trunks* and ſome of the *Ramifications* of the *Arteries* of an Adult *Human Body* filled with Wax, to ſhew the *Variety* in Nature, and ſupply the *Defects* of the *former Figure*.

1, The *Aorta* cut off at the *Baſis* of the Heart. A, The three *Semilunary Valves*, as they appear when the *Heart* is in *Diaſtole*, and hinder the Blood coming back from the *Arteries* into the *Left Ventricle* of the Heart. B, a Portion of the *Trunk* of the *Arteria Pulmonalis*. *b*, *b*, It's Diviſion before it paſſes to the right and left Lobes of the Lungs. C, The *deſcending Trunk* of the *Arteria Magna*. D,D, The *Internal Mammary Articles*. 2, The *Trunk* of the *Coronary*, cut off. 3, The *Ligamentum Arterioſum*, which in the *Fœtus* is the *Canalis Arterioſus*, and conveys Blood from the *Pulmonic* Artery to the *Great* Artery. 4, The Trunk of the *Subclavian* Artery. 5, 5, The *Carotids*. 6, 6, The *Vertebrals*. 7, 7, The Arteries which paſs to the lower Parts of the *Face*, *Tongue*, adjacent *Muſcles* and *Glands*. 8, 8, The Trunks of the *Temporal Arteries* ariſing from the *Carotids*, giving Branches to the *Parotid Glands* (9, 9,) and the *Temples* (10, 10,) *&c.* 11, 11, The Occipital Arteries. 12, The Arteries of the *Fauces*, *Gargareon*, &c. 13,13, The *Contortions* of the *Carotid Arteries*, as they paſs the *Baſis* of the *Skull*: Theſe Trunks of the *Carotid* Arteries in *Dogs* (like thoſe, I gueſs, of moſt *Quadrupeds*) are very much *contorted* before they reach the *Baſis* of the *Skull*; on filling theſe *Veſſels* of that *Animal* with *Wax*, I found thoſe Branches of *them* which paſs to the *Brain*, firſt clipping the hinder Parts of the lower Jaw, immediately under it's *Condiloide Proceſſes*; where thoſe Arteries are received in two *Sinus's* of that Bone; which *Sinus's* may alſo be ſeen in the *Jaw-bones* of other Quadrupeds, but not in Human Bodies. 14, 14, Thoſe Parts of their Trunk that paſs by each Side of the *Sella Turcica*, whence divers ſmall Branches ariſe, and help to compoſe the *Rete Mirabile*; which is more conſpicuous in *Quadrupeds* than in *Human Bodies*. 15,15, The *Contortions* of the *Vertebral* Arteries, where we find their Trunks conſiderably dilated. 16, The *Vertebral* Arteries, as they aſcend on the *Medulla Oblongata* towards the *Annular Protuberance* or *Pons Varolii*. 17, 17, The communicant Branches of the *Vertebral* and *Carotid* Arteries. 18, 18, The Arteries of the Brain diſplayed. Fig. 167.

Fig. 168, repreſents one of the *Trunks* of the *Arteries* of the *Tibia* diſſected from the Leg after *Amputation*. Fig. 168.

Mr *Stringer* was in his ſixty-ſeventh Year when this Artery was taken from him, and near twenty Years before loſt the Uſe of both his *Legs*; and in that time he had been ſo perſecuted with Convulſions in *them*, that neither Leg was free a quarter of an Hour together, whether ſleeping or waking. At length one of his little Toes mortified, which was taken off by Mr *Goldwyer* of *Salisbury*; not long after more Toes of the ſame Foot followed the like Fate: The Convulſions following that Leg ſtronger and quicker, that Part of the Foot next the Toes became tumid and inflamed, the Tumour extending itſelf above the *Malleoli*: A ſinuous Ulcer paſſed by the Side of one of the *Metatarſal Bones*; the Extremity of which Bone (whence the Toe was *Of a* Mortification.

taken off) lying bare. In this Condition I found the left Foot and Leg of this Gentleman in *Wiltſhire*, where I met with Mr *Goldwyer*; and finding the Leg very chilly, the Neceſſity of parting with it was too evident; which Mr *Stringer* ſuffered; not ſo much as expreſſing the leaſt Out-cry during the *Operation*, tho' the Part did not want the moſt exquiſite Senſe of Feeling. On the Abſciſion (which was about five or ſix Inches below the Knee) it was unexpected, by me, to ſee ſo little Blood ſpouting from the Arteries. The Stump being bound up, and committed to the Hands of two or three Servants, a leſs number not being ſufficient to hold it, by reaſon ſuch ſtrong convulſive Motions purſued the Part on the Operation, I was very deſirous to examine the *Arteries* of the amputed Leg, having before diſcovered the Cauſe of a Mortification of the Arm of a *young Gentlewoman*, who died not long after an Amputation of the Part, tho' the *Gangrene* did not appear to reach near the Place where the Abſciſion was made (*i. e.* below the ending of the *Muſculus Deltoides*): In which *Caſe*, I found the Sides of the Trunk of the *Artery* of the Arm ſo thickened, that the *Diameter* of it's *Bore* was contracted to leſs than a third Part, and would ſcarce admit a common Probe to paſs it: *vid. Fig.* Fig. 172. 172. G, H, I. When I had found the Ends of the *Arteries* in the Leg abovementioned, I endeavoured to paſs my Probe into one of them; but meeting with ſome Oppoſition, I ſuſpected I had miſtaken the *Vein* for the *Artery*, and that the Valves oppoſed the paſſing of the Probe that Way: But, on farther Diſſection, I cleared the Trunks of both thoſe Blood-Veſſels, and found the Veins in their natural State; but the Sides of the *Arteries* were grown *bony* or *ſtony*: Having cleared two of *their Trunks*, I left one of them at *Salisbury*; the other I brought to Town, and is here figured.

Fig. 168. A, The *upper Part* of the *Artery* cut off in the Amputation of the *Leg*; from A to B, The *Trunk* of the *Artery diſtended*, and dried, to ſhew it's *Canal*. C, That *Part* of the *Trunk* of the *Artery* which was ſo contracted by the *Petrifaction* or *Oſſification*, that a *Probe* would not paſs it's *Canal*; from C to D, The Trunk of the Artery *opened* and *expanded*. E, E, The *Petrifactions* or *Oſſifications* in the Sides of the Artery. F, F, Their *Specks* in the lower Part of the Artery, not ſo large as in the upper Part, and placed at greater Diſtances. *a*, *a*, &c. The *Branches* ariſing from the Trunk of the Artery.

Fig. 172. *Fig.* 172. G, A Portion of the *Trunk* of the *Artery* of the *Arm* abovementioned. H, The *Sides* of the *Artery* very much *thickened*, whereby the *Diameter* of it's *Canalis* were ſo diminiſhed, that the Probe *I* would not paſs it.

The *Oſſifications* in the Coats of *Arteries* have been frequently obſerved, eſpecially in their large Trunks within the Cavities of the *Thorax* and *Abdomen*: But I don't remember the like has been taken Notice of in the *Libms*; or that ſuch Impediments in their Canals have been found the Cauſe of *Mortifications* of particular Parts, as in the Inſtance abovementioned; though I doubt not but the like has often happened in aged People, eſpecially where we find the Progreſs of the *Gangrene* not very ſwift, and it's Beginning from no external *Cauſe*; the Conſequences of which are commonly found fatal. When the Arteries of one Leg (or of any other Limb) are ſo affected, we may well ſuſpect the like in *thoſe* of other Parts; which, probably, happened in the Caſe abovementioned; for tho' no Gangrene came on the Stump, yet the other *Foot* and *Toes* began to *mortify* about ſix Weeks after the Amputation, as did the Parts about the *Hips*, which were compreſſed in lying or ſitting, before he expired.

Fig. 169. *Fig.* 169, repreſents the *Extremities* of the *Blood-Veſſels*, as they appear while the Blood is paſſing them in the *Omentum* of a *live Dog*, viewed with a *Microſcope*.

A, A, The *Branches* of *Arteries*, and B, B, the *Veins* which aſſociate. C, C, their *leſſer Banches* where they paſs from each other, and are united at their *Extremities*.

Fig. 170. *Fig.* 170. The like appearing in the *Meſentery* of a Dog when living. D, D. The *Areæ*, that are here viewed with the Microſcope, as they appear to the naked Eye.

Fig. 165. *Fig.* 165. The *Trunks* of the *Vena Cava*, with their *Branches* diſſected from an adult Human Body.

A, A, The Orifice of the *Vena Cava*, as it appears when cut from the *Right Auricle* of the *Heart*. *a*, The Orifice of the *Coronary Vein* of the *Heart*. B, A, The *Superior* or *Deſcending Trunk* of the *Vena Cava*. C, C, A, The *Inferior* or *Aſcending Trunk*; ſo diſtinguiſhed, from the Motion of the Blood in theſe Trunks, which is contrary to their Poſition. D, D, The *Subclavian Veins*. †, That Part of the *Left Subclavian Vein*, where the *Thoracic Duct* enters it, and diſcharges itſelf of it's *Chyle* and *Lympha*. *b*, The *Vena Azygos*, with it's Branches going to the Ribs *e*, *e*. *c*, The *Superior Intercoſtal* Veins. *d*, *d*, The *Internal Mammary* Veins. E, E, The *Right* and *Left Iliac* Branches. F, F, The *Internal Jugular* Veins. G, G, The *External Jugulars*. H, H, The *Veins* which bring Blood from the *lower Jaw* and it's *Muſcles*. I, I, The Trunks of the *Internal Jugulars* cut off at the *Baſis* of the *Skull*. *f*, The Veins of the *Thymus* and *Mediaſtinum*. *g*, *g*, The Veins of the *Thyrotid Glands*. *h*, The *Vena Sacra*. *i*, The *Internal Iliac Branch*. *k*, The *External* ———. K, The *Occipital* Veins. L, The *Right Axillary* Vein. M, The *Cephalic*. N, The *Baſilic*. O, The *Median* Vein. P, The *Trunk* of the Veins of the *Liver*. Q, The *Phrenic* Vein of the *Left Side*. R, The *Right Phrenic* Vein. *r*, A large Vein from the *Left Glandula Renalis* and Parts adjacent. S, The *Left Emulgent* Vein. T, The *Right*

Emulgent in this Subject, very much lower than the Left, which is not uſual. V, V, The two *Spermatic* Veins. X, X, Two *Communicant* Branches between the *Aſcending* Trunk of the *Vena Cava* and *Vena Azygos*, by which the Wind paſſes into the *Deſcending* Trunk of the *Cava*, when we blow into the *Aſcending* at A, P, C, tho' the Trunk at A, P, and C, is firmly tied on the Blow-pipe. * An uncommon Branch between the Lower Trunk of the *Vena Cava* and the *Left Emulgent* Vein. *y*, A Vein which brings Blood from the *Muſcles* of the *Abdomen* into the External *Iliac* Branch. *z*, The *Epigaſtric* Vein of the *Right* Side. *l*, The *Vena Saphena.*

The reſt of the Branches here diſplayed commonly differ ſo much in various Subjects, that the particular Deſcriptions of them, (which none but the *Operator* who diſſected them could pretend to be Maſter of) would be perhaps as uſeleſs, as tedious to repeat; wherefore I paſs to thoſe conſiderable venous Trunks *which* are wanting in this *Scheme.*

Fig. 171. *Fig.* 171. Some of the large *Trunks* of the *Veins* and their *Sinus's* within the *Skull*, with the *Beginnings* of the *Internal Jugular* Veins, filled with Wax, and dried together with the *Falx*, &c.

A, The Extremity of the *Falx* cut from the *Criſta Galli*. *a*, It's lower *Limbus* that touched the *Corpus Calloſum*, as it divides the right Hemiſphere of the Brain from the left; where the fifth *Sinus* paſſes, which is here dried and diſappears. B, B, The ſecond *Proceſs* of the *Dura Mater*, which ſupported the hindermoſt Parts of the *Lobes* of the *Brain*, and defended the *Cerebellum* from being preſſed by thoſe Parts of the *Cerebrum*. C, A Portion of the *Dura Mater*, remaining to the *longitudinal Sinus*. D, D, Several Trunks of the *Veins* of the *Brain* cut off before they enter the *longitudinal Sinus*. E, E, The *longitudinal Sinus's*. F, F, The two *lateral Sinus's*. G, The *fourth Sinus*. *g*, The Veins from the *Plexus Choroides*. H, H, The *Bulbi* or *Diverticuli* at the *Beginnings* of the *Internal Jugular* Veins. I, I, The *Internal Jugular* Veins. K, K, The Trunks of *Veins*, which bring Blood from the lower *Jaw*, and Parts adjacent.

Fig. 166. *Fig.* 166. The Trunks of the *Venæ Portæ* diſſected and diſplayed.

A, A, The Branches of the *Venæ Portæ* freed from the *Liver*. *a*, The *Umbilical* Vein. B, The *Splenic* Branch. C, C, The *Meſenteric* Branches which are continued from the Inteſtines. *b*, The Trunk of the *Vena Pancreatica*, which receives Branches alſo from the *Duodenum*. *c*, *c*, The *Vena Gaſtrica dextra Coronaria Superior*. D, The *Superior Coronary* Vein of the *Stomach* of the *left* Side. E, The *Inferior Coronary* Branch of the *Stomach* of the *right* Side; and F, The ſame *Coronary* Vein of the *left* Side removed from their proper Situations; from theſe two laſt are continued the *Vena Epiploica Superior dextra* 1, and the *Siniſtra* 2, with the *Media* 3. G, The Vein called *Vas Breve*. *d*, The *Vena Duodeni.*

H,

Fig. 167.

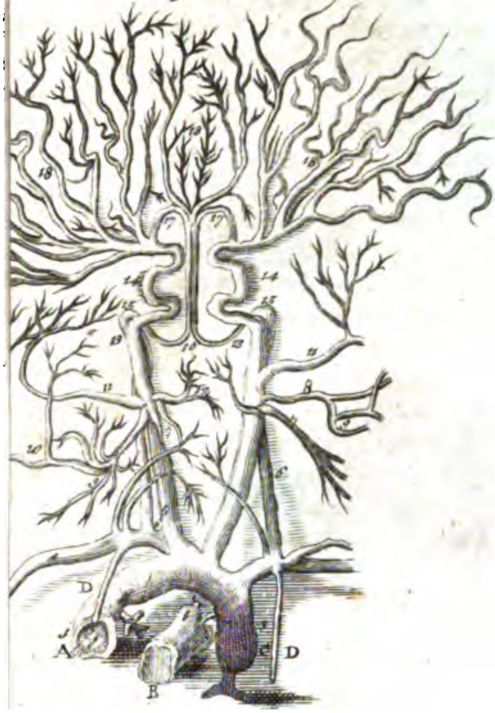


Fig. 168.

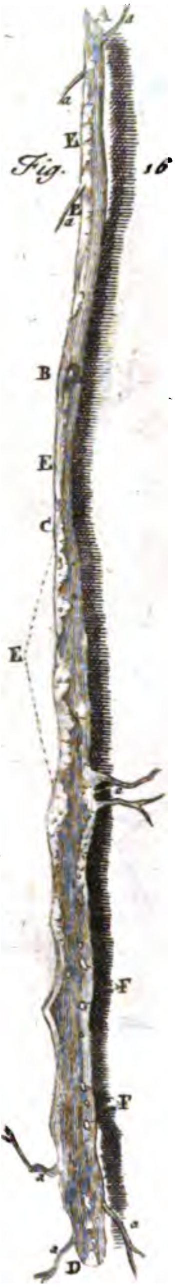
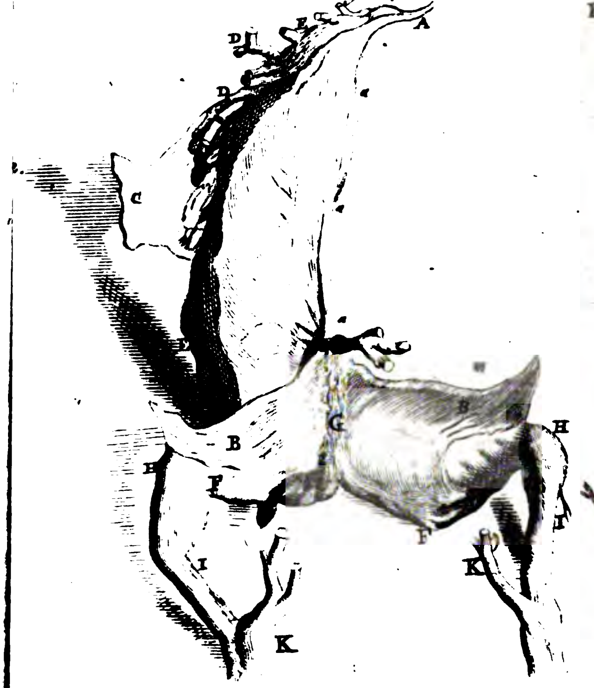


Fig. 171.



H, The *Vena Hæmorrhoidalis* ariſing from the *Rectum* and *Anus*, in this Subject emptying itſelf into the *left* Meſenterick Branch; but in other Bodies I find this Trunk of the *Hæmorrhoid* Veins ending in the *Ramus Splenicus*.

Of the Hæmorrhoid *Vein.*

The Length of the Trunk of this Hæmorrhoid Vein, and it's Progreſs under the *Inteſtines*, render it liable to be compreſſed, and it's refluent Blood retarded; whence it's Branches in the *Inteſtinum Rectum* and *Anus* become diſtended with Blood, and cauſe the *Hemorrhoides Cæcæ* and *Apertæ*; which are frequently attended with *Apoſthumations* in the *Anus* and Parts adjacent; which Diſorders are the more incident, not only becauſe theſe Hæmorrhoid Veins (like the reſt of the Branches of the *Vena Porta*) are without *Valves*, and the Blood had an aſcending Progreſs in them, together that the long Trunk (H) is not only expoſed to the Compreſſions made by the *Inteſtines* in both Sexes; but particularly the *Uterus* in *Women* in time of *Geſtation*, eſpecially near the Birth, ſo compreſſes this *Trunk*, that it is no wonder we find Women more afflicted with the *Hæmorrhoids* at that *Time* than at any other. Nor are the *Iliac* Veins and the *Lympheducts* that accompany them, without being expoſed to the like Incumbrance in Women with Child, whence the Veins of the Legs and Thighs become *varicoſe*, and thoſe Limbs are ſo frequently ſwelled; which in a late Inſtance, I was acquainted with, when the Intumeſcence proved ſo great, that at length the Abdominal Teguments were vaſtly extended; but the Gentlewoman recovered (beyond the Expectation of ſome) on the Delivery of two large Children.

Of Oſſifications *in the Coats of the* Arteries, *&c. by Mr* W. Cowper. *n.* 299. *p.* 1970.

IV. I have given an Account before † of a Caſe, when the Trunks of the Arteries of the Leg, were obſtructed by Petrifications or Oſſifications, in a Perſon about the 67th Year of his Age; ſince which I have met with ſeveral of the like Inſtances in People of Years; particularly in the Leg of an old Gentleman, whoſe Toes and Foot were ſphacelated, the Arteries of whoſe Leg I have by me injected, (as much as they could be) with red Wax; in which the Oſſifications diminiſhing their Channels in ſome Places, and totally obſtructing them in others, is made very evident, in the *Preparation* in the *Repoſitory* of the *Royal Society*.

† Vid. Supra. *p.* 343.

The *Oſſification* or *Petrifaction* in the *Great Artery*, at it's Riſe from the Heart, has been ſo commonly found, that ſome think it is conſtant: How it may be in ſome Animals I cannot be certain, but in Human Bodies I am well aſſured, whenever it happens, it is a Diſeaſe, and does in ſome meaſure incommode thoſe Parts in the due Execution of their Office, as the following Caſes will evidence: I ſhall ſet down the Symptoms before Death, which may help our Conjectures when the like offers again. A ſpare Man about 30, who languiſhed with an Ulcer in the Thigh, attended with a *Caries*, or Rottenneſs of that Bone at it's Articulation with the *Tibia* and *Patella*, called the Knee, where all thoſe Bones were affected, at length fell into a true *Phthiſis*, and coughed up no ſmall Quantity of *Pus*; ſome Months before his Death I frequently ſaw him, when he would often offer me his Wriſt, to feel his unequal Pulſe; the Artery there miſſing ſometimes one, ſometimes two Strokes in ſix or ſeven: At firſt he told me he obſerved it miſſed but one in ten; but at length thoſe Stops became more frequent, eſpecially on any Agitation of the Body or Mind: Though a *Polypus* in any of the great Veſſels about the Heart may induce that Symptom; yet the Continuance of it ſo long before Death, ſhews it owing to ſome other Cauſe, as appeared on opening the Heart and great Artery of this Perſon. A, A, A, D, G.

Fig. 173. A, A, The Trunk of the *Great Artery* opened and diſplayed.

a, *a*, *a*, The three *Semilunary Valves* of the *Aorta*, which hinder the Blood from returning to the *Heart*, after it is expelled thence by it's *Syſtole* or Contraction; theſe *Valves* in this Caſe were ſomewhat thicker, and not ſo pliable as naturally, and did not ſo adequately apply to each other, as is expreſſed *Fig.* 176, *a*, *a*, *a*. Whence it happened ſometimes, that the Blood in the great Artery (A, A, A, *Fig*, 173.) would recoil, and interrupt the Heart in it's *Syſtole*. But this Stubbornneſs of theſe Valves was owing to a bony or ſtony Body, marked *b*, *Fig*. 173. which appeared much plainer when the Valves were dry; as is repreſented in the Figure beneath, marked with an *: *a*, *a*, The two *Valves* pinned out and dried; *b*, The *Petrifaction* or ſtony Body at their Junction. In this Inſtance I obſerved the *left Ventricle* of the *Heart*, expreſſed at G, G, D, D, *e*, *e*, *f*, *f*, *Fig*. 173, to be a little dilated from it's natural Size, but was not by two Parts in three ſo big as the *left Ventricle* of the Heart of one I diſſected in the Preſence of Dr *Sloane*. The Symptoms, ſome Years before the Death of this Perſon, who was about forty Years of Age, were, extraordinary Shortneſs of Breath, eſpecially on any Fatigue, with an Intermiſſion of one Stroke in three of the Pulſe; his Poſture of ſitting up was more eligible than any other; he complained of great Faintneſs, and now and then Pain about the Heart; the extream Parts often cold, which, towards his Death, increaſed more and more on him; his Legs and Arms being gangrened ſome Hours before; inſomuch that the Corps was very offenſive in opening, though 'twas done within 24 Hours after he expired, in the Month of *November*.

Upon opening the Cheſt, the *Heart*, particularly it's *left Ventricle*, was found larger than that of an ordinary Ox, and filled with coagulated Blood. The *Valves* of the *Great Artery*, A, A, *Fig*. 173, were petrified, inſomuch that they could not approach each other, as expreſs'd, *Fig.* 174, and 176; but an *Orifice* repreſented at *Fig.* 177, remained always open by the Petrifactions *b*, *b*, *Fig.* 175, and *a*, *a*, *Fig.* 177, which had clogg'd theſe Valves, and hindered their Application to each other, as in the natural State is repreſented in *Fig.* 174, and 176, *a*, *a*, *a*.

The Explication of the Symptoms in both theſe Caſes is obvious enough; for though the Perſon firſt inſtanced did not die of the ſame Diſeaſe with the laſt mentioned, yet the Symptoms in his Illneſs plainly ſhewed what muſt follow from the Diſorders of theſe Valves, as they are rendered more or leſs uſeleſs: For as their Office is to prevent the Return of the Blood into the Heart, in it's *Diaſtole*, by exactly ſhutting up the Paſſage of the *Aorta* (as the Flaps in Water-Engines); ſo if by any Accident they are hindered from doing their Duty, as they were by the Petrifactions, the Conſequences muſt be, not only a Regurgitation of Blood into the Heart, but they baulk it's impulſive Force, when the Muſcular Fibres (which are in theſe Valves) cannot contract to prepare the Paſſage for the Blood of the left Ventricle, when to be expelled into the *Aorta*. Hence the Intermiſſions of the Pulſe in the firſt Inſtance may be accounted for. In the latter Inſtance, theſe Valves were wholly uſeleſs, the Circulation became more difficult, as appear'd by the Refrigeration of the extream Parts, Gangrenes, *&c.* In both theſe Caſes the left Ventricle of the Heart was dilated proportionably to the ill Conſtitution of theſe Valves, which clearly ſhews theſe Valves give that Aſſiſtance to the Heart in it's Office, that it cannot be without, and that it gradually ſuffers according to their Indiſpoſition.

I have lately obſerved a like Inſtance in an elderly Gentleman, about 72, who had ſometimes Intermiſſions in his Pulſe ſeveral Years before his Death; in whom I found divers *Petrifications* in the *Mitral* and *Semilunary Valves* of the left Ventricle of the Heart.

I might here add ſome Anatomical Remarks on the Structure and Mechaniſm of this Organ, particularly of the Uſe of that *Tranſverſe Tendon* expreſs'd at *f*, *f*, *Fig.* 173, and the Progreſs and Inſertions of the *Tendons f*, *Fig.* 175, ariſing from the *Carneæ Columnæ*, *e*, *e*, which do not all terminate in the lower Margin of the *Mitral* Valve *d*, *Fig.* 174, and 175, but paſs to the upper and middle Part of that Valve, whilſt others terminate in the Baſis of the Heart, with the muſcular Structure of the Semilunary Valves.

Fig. 173, repreſents the *left Ventricle* of the *Heart* opened, *&c.* Fig. 173.
A, A, A, The Inſide of the *Aorta* ſlit open to the *left Ventricle.*
B, B, The *Bulbous Trunk* of the *Vena Pulmonalis* divided through, and pinned aſide, to ſhew, *a*, *a*, *a*, the three *Semilunary* Valves of the *Aorta*, which hinder the Blood from returning to the Heart.

b, A ſmall ſtony Body at the Conjunction of two of the *Semilunary* Valves, expreſs'd at the * below this Figure. *a*, *a*, Parts of the two Valves. *b*, The *Petrifaction*, as it appears in the dried Valves. C, Part of the lower Trunk of the *Vena Cava*, cut off immediately above the *Liver*. *c*, *c*, *c*, The *left Auricle* opened and pinned out. D, D, The Sides of the *left Ventricle* divided and drawn aſide, to ſhew it's Inſide *d*, *d*, *e*, *e*, *f*, *f*, G, G. *d*, *d*, The *Mitral* Valves of the *left Ventricle* of the *Heart*, or *Arteria Pulmonica* divided and turned aſide. *e*, *e*, The *Carneæ Columnæ*, whence ſpring the Tendons faſtened to the Valves, *d*, *d*, expreſs'd *Fig*. 175, *d*, *f*. *f*, *f*, A tranſverſe Cord or *Tendon*, by which the *Columnæ Carneæ* are drawn nearer each other in the *Syſtole*, or Contraction of the Heart, when the Blood is expell'd into the *Aorta*; whereby the Tendons (expreſs'd *f*, *f*, *Fig*. 175, and 177) draw the *Mitral* Valve laterally; by which means it's Orifice, *g*, *c*, *Fig*. ibid. is not only cloſed, to prevent the Return of the Blood by the *Vena Pulmonalis*, but at the ſame Time it opens a Paſſage for the Blood of the *Arteria Magna*, by withdrawing the *Mitral* Valve, *d*, *Fig*. 174, from the Orifice of the *Aorta*, *a*, *a*, *a*, *g*. G, G, The *Internal Surface* of the *left Ventricle*, where it is ſomewhat ſmoother as it leads to the *Aorta*, *g*, *g*, The Trunk of the *Coronary Vein* divided when filled with Wax. *h*, *h*, The *Coronary Artery* in like manner divided. *i*, One of the Trunks of the *Vena Pulmonalis*. *k*, *k*, *k*, The three *Orifices* of the Trunks of the *Vena Pulmonalis*, as they open into the *Bulbous Trunk*, expreſs'd at B, B. H, The *Cone* of the *Heart*.

Fig. 174. *Fig*. 174. A, Part of the *Aorta* next the Heart.

a, *a*, *a*, The three *Semilunary Valves* as they appear next the *Heart* in a *natural State*, when the Heart is in *Diaſtole*, and the Blood hindered by theſe Valves from returning to it's left Ventricle. *b*, *b*, Part of the *Baſis* of the *Heart* cut off. *c*, *c*, The two *Columnæ Carneæ* of the left Ventricle. *d*, The Mitral Valve. *f*, *f*, The *Tendons* ſpringing from the *Carneæ Columnæ*, and inſerted into the upper and middle Parts of the Valve, as well as to it's lower Margin; which is better expreſs'd in the following Figure. *g*, The Orifice of the *Aorta* compleatly cloſed by the Application of theſe three Valves to each other.

Fig. 175. *Fig*. 175, ſhews the ſame Parts expreſs'd in the preceding Figure, as they appear'd when the Valves of the *Aorta* were *petrified*: The ſame Letters alſo directing to the Parts already explain'd, except *a*.

a, Part of one of the Valves which were not cover'd with the Petrifaction, *b*, *b*, *b*, The *Petrifactions* on the reſt of the *Valves*. † A ſmall *Petrifaction* on the *mitral Valve*. *b*, *b*, *b* Some of the *tranſverſe Tendons* which draw the *Carneæ Columnæ* to each other, when

when the *Heart* is in *Syſtole*, for the more effectual *cloſing* the *Orifice* of the *mitral Valve*, expreſs'd here at *g*.

Fig. 176, 177.

Fig. 176, 177, ſhew the ſame Parts repreſented in the two preceding Figures, as they appear view'd towards the Heart, when dry'd and diſplay'd.

A, A, The Trunk of the *Aorta*. *a*, *a*, *a*, *Fig.* 176. The *Semilunary Valves* in a *natural State*, when the *Blood* in the *Arteries* preſſes them cloſe to each other. *b*, *b*, *b*, *b*, The Trunks of the two *Coronary Arteries* cut off. *a*, *a*, *Fig.* 177. the *Semilunary Valves* petrified. *c*, The *Orifice* of the *mitral Valve* next the *Vena Pulmonalis*. *d*, *d*, *d*, The *internal Surface* of the *mitral Valve*, leading into the *left Ventricle*. *e*, *e*, *e*, The *Columnæ Carneæ*. *f*, *f*, Their *Tendons*. *g*, *g*, The *tranſverſe Tendons* which draw the *fleſhy Columns* to each other when the *Heart* is in *Syſtole*.

An Anatomical Account of Old Bayles, *ſuppoſed to have been* 130 Years *old*; *by Dr* James Keill. *n*.306.*p*.2247.

V. *John Bayles*, the old Button-maker of *Northampton*, is commonly reputed to have been 130 Years of Age when he died. There is no Regiſter ſo old in the Pariſh where he was Chriſtened; but the oldeſt People, of which ſome are 100, others 90, and others above 80 Years, remember him to have been old when they were young. Their Accounts indeed differ much from one another, but all agree that he was at leaſt 120 Years. He himſelf did always affirm that he was at *Tilbury* Camp, and told ſeveral Particulars about it; and if we allow him to have been but 12 Years old then, he muſt have been 130 when he died.

He uſed conſtantly to walk to the neighbouring Markets with his Buttons within theſe 12 Years, but of late he has been decrepid, and carried abroad. His Diet was any thing he could get. I never heard he was more fond of one ſort of Food than another, unleſs it was that about a Year before he died he longed for ſome Veniſon-Paſty, but had it not. He died the 4th of *April* 1706. He lived in three Centuries, and in ſeven Reigns.

His Body was extremely emaciated; and his Fleſh feeling hard, the Shape of all the external Muſcles was plainly to be ſeen through the Skin.

The *Abdomen* being laid open, the whole *Viſcera* appeared in good Order, but more pale than they are commonly.

The *Omentum* was very ſmall.

The *Stomach* was very much diſtended with Wind, and the Bottom of it wore extremely thin in that Part which is next the Spleen, being hardly thicker than thin Writing Paper. In the Inner Membrane there were no *Plicæ*.

The *Liver* was pale, but, upon cutting, was found perfectly ſound. The *Gall-bladder* was of a larger Size.

The *Spleen* was not ſo big as one of his Kidneys.

His *Kidneys* were firm and ſound, as were all the Urinary Paſſages. In the right Kidney were a few ſmall yellow Grains of Gravel.

The *Inteſtines* were all ſound: The Meſentery was cover'd with Fat.

The *Cartilages* of the *Sternum* were not harder than uſually they are. The Ribs were brittle; for by leaning gently upon one of them, it broke.

The *Lungs* were attach'd to the *Pleura*: They were ſpongious, whitiſh, with many ſmall black Spots of Blood. The Cavity of the *Thorax* was large and clear.

The *Heart* was large, thick, and fat; and though he was always a little Man, yet the Diameter of the *Aorta*, before the *Carotidales* go off, was above two Inches; which is conſiderably bigger than ever I remember to have ſeen.

The *Aorta* in the *Abdomen* and *Iliacs* were, for the greateſt Part, cartilaginous.

The Bones of the *Skull* were ſound and good.

On the Inſide of the *Dura Mater*, by the *Falx*, was a ſmall *Oſſification*.

The *Brain* was more firm and ſolid than uſual, and, in cutting, hardly moiſten'd the Sides of the Knife. The *Ventricles* were full of *Serum*. He had loſt the Uſe of his Eyes for ſome Years; but his Hearing was good 'till he died. His Genitals, both *Teſticles* and *Penis*, were of a large Size.

There is no doubt but that the Weakneſs of his *Stomach*, and the Hardneſs of the *Aorta*, were the Cauſes of his Death. The Coats of the Stomach were ſo thin, that they had not Strength enough to keep out the Air, and conſequently his Digeſtion muſt have been ſpoil'd. He had not eat Meat for ſome Years, and of late he lived only on Small-Beer, Bread and Butter, and Sugars. And it was impoſſible that his Blood could circulate duly, whilſt the Great Artery, having loſt it's Elaſticity, by being become cartilaginous, could give no Motion to the Blood. It is very probable that this was the Cauſe of his irregular and intermitting Pulſe, which I have felt ſome Years before he died. It is obſervable, that the greateſt Part of his Blood (which was in greater Quantity than I expected) was contained in the Arteries; whereas, generally, in all dead Bodies the Veins are full, and the Arteries almoſt empty: For the Arteries being diſtended by the Blood, which they receive upon the laſt Syſtole of the Heart, by their natural Elaſticity contract again, and empty themſelves into the Veins, from whence it returns no more; but in this Man, the Great Artery having loſt the Power of contracting itſelf, it retain'd the Blood it receiv'd by the laſt Syſtole of the Heart.

This Account agrees with that given of Old *Parre* by Dr *Harvey*, in moſt Particulars, except in the Cauſes of their Deaths. But in both, nothing ſeem more remarkably the Effects of Old Age, than the Smallneſs of their *Spleens*, which undoubtedly was owing to the Contraction of their Fibres in ſuch a lax and ſpongious Bowel.

The Whiteneſs of the Bowels in both, muſt be likewiſe either from the ſame Contraction or Cloſeneſs of the Coats of the Blood-Veſſels, or from a Want of Blood. *Harvey* ſays nothing of the Quantity of Blood he found in Old *Parre*; but if we may gueſs from his Body being fleſhy, from the Goodneſs of his Stomach and Appetite, and from the Diſeaſe he died of, there could be no Want of Blood in him. In this Man there ſeem'd to be more Blood than in ſeveral others I have ſeen, whoſe Bowels appear more red. And it can hardly be conceiv'd that the *Aorta* could be ſo large, without a large Quantity of Blood, unleſs there had been ſome Stricture upon ſome other Parts of it, which I did not perceive: And therefore it ſeems not improbable, that this Whiteneſs of the Bowels, was owing to the Cloſeneſs of the Blood-Veſſels in both. It is no ſmall Confirmation of this Opinion, that the Fleſh and Skin felt hard, and the Brain firm and ſolid. I might add, that it is highly probable that the ſame Diſpoſition might give a Cloſeneſs or Hardneſs to the Veſſels every-where elſe. It is true, this was a Diſtemper; but then it is as true, that it is a Diſeaſe of Old Age, and may juſtly be reckon'd one of the Effects of it. And for a farther Proof of what I have ſaid, I cannot but take notice, that in preparing a Piece of the Small Gut for an Injection, the *Tunica Villoſa* felt more like a fine File, than the ſofteſt Velvet; and that I could uſe more Violence in injecting the Veſſels, than theſe Parts will uſually bear. Whoever conſiders how ſoft a Subſtance an Animal Body is at it's firſt beginning, and how from time to time it acquires a Firmneſs and Solidity, will eaſily be induced to believe, that old Age brings a more than ordinary Hardneſs to all the Fibres and Veſſels.

The neceſſary Conſequence of this Hardneſs and Contraction of the Fibres and Veſſels of Old People, is a Diminution of their Secretions, which, *cæteris paribus*, are always proportional to the Orifices of the Glands. Hence it is, that we find the Skin of Old People always dry, their Perſpiration being very little: They are likewiſe generally bound; Old *Bayles* went to Stool but once in ten or twelve Days, for ſome Years; and Old People are always complaining of a want of Moiſture; not that the Radical Moiſture is dried up, but becauſe the natural Secretions, by reaſon of the

Contraction of the Glands, are diminiſhed. I have already obſerved, that we found in this Old Man more Blood than could have been expected in ſuch an emaciated Body; and without doubt it had been larger, if his Stomach and Appetite had been as good as Old *Parre*'s. The Fulneſs of the Veſſels, and the frequent Rheums and Catarrhs of Old People, evince this neceſſary Conſequence of the Cloſeneſs of the Coats of the Veſſels: All which agrees with what the Writers of *Inſtitutions* ſay, that old Men are *ratione partium ſolidarum frigidi & ſicci, ratione excrementorum frigidi & humidi.*

From this Retention of the excrementitious Parts of the Blood, we may expect all the ill Conſequences of a vitiated *Plethora*, and languid Motion of the Blood; for the Fibres of the Arteries being now become hard, they, inſtead of aſſiſting, obſtruct the Heart in circulating the Blood; and the Quantity of animal Spirits ſeparated in the Glands of the Brain muſt likewiſe be leſs, not only becauſe of the Retention of the Excrementitious Humours, but alſo becauſe of the Cloſeneſs and Firmneſs of the Brain itſelf; ſo that the Contractions of the Heart and all the Muſcles muſt be weak, and conſequently the Motion of the Blood languid.

A due Conformation of all the Vital Parts, is moſt certainly neceſſary to bring a Man to a full old Age; but above all the reſt, there are two which to me ſeem to have had the greateſt Share in procuring a Longævity to Old *Parre* and *Bayles*, by retarding the ill Effects juſt now mentioned. The firſt is the Heart, which in both was ſtrong and fibrous; for that being left alone to labour, the Circulation of a large Quantity of ſluggiſh Blood, a great Strength is abſolutely requiſite to propel the Blood through unactive Veſſels to the Extremities of the Body, and back again. No doubt this is more eaſily done in Men of a low Stature, (as Old *Bayles* was) which,. I am apt to think, was a Qualification of Old Age. The ſecond was, the Largeneſs of their Cheſts, and Goodneſs of their Lungs, by which the Air had it's full Effort upon every Particle of the Blood, in rendring it florid, and attenuating it, that it might eaſily move through the contracted Channels of an old Body.

In order, then, to attain Old Age, the Indication ſeems to be, to preſerve ſuch a Softneſs in all the Fibres, that they may eaſily yield to the Preſſure of the Blood, and, by their Elaſticity, reſtore themſelves to their former State, giving thereby a new *Impetus* to the Blood.

A ſtrange Hæmorrhage; *by Mr* F. Mongino', *n.* 268. *p.* 756.

V. 1.] Madam R———'s Girl fell into violent Convulſion Fits; and while ſhe was in them, voided a large Quantity of Blood by the Mouth, the Noſe, the Ears, and the Eyes. The Mother ſhewed me ſome bloody Tears ſhe had gathered. All theſe Symptoms were over in half an Hour's time; and the Girl, who ſome Days before had been taken with a violent Head-ach attended with a Fever, and a mighty Oppreſſion, was very well preſently after that *Hæmorrhagia.* The ſame Accidents, as I hear, have happened ſeveral times. I was apt to believe they were *Epileptic Fits*; but the ſudden Relief and Ceſſation of them, by bleeding through all theſe Parts, is wonderful.

—*Ibid.*

I have enquired more nicely into this Caſe, and had the following Particulars from the Mother. Her Daughter was between two and three Years old, when on a ſudden ſhe complained of a very violent Head-ach: She was alſo obſerved to be feveriſh, and extreamly reſtleſs. At the ſame time her Eye-lids did very much ſwell, and they were ſo heavy, that one could hardly open her Eyes but with a great deal of Pain. Theſe Symptoms did continue for three or four Months, though ſometimes more or leſs violent. At laſt ſhe fell into Convulſive Motions of her Arms, Legs, and other Parts, and theſe were very fierce for two Days, 'till ſhe began to bleed by the Noſe, the Mouth, the Ears, and the Eyes: The Linen Cloths, that were then applied to the Eye-lids, were all wet and bloody. This *Hæmorrhagia* laſted above a Day; and, what is more remarkable, when it was expected that the Child ſhould be extreamly weakened, ſhe found herſelf ſo well freed from her Illneſs, that ſhe came to her Gaiety again, and aſked for ſome Victuals. Within twelve Months after ſhe had four of theſe *Attacks*, but not ſo great; in particular, the Convulſion-Fits were very inconſiderable, in compariſon of the firſt. The ſame Symptoms did not return again, above two or three times every Year, and the Head-ach did not continue above eight Days before the *Bleeding*; and even then it was much more ſupportable. About two Months ago I was ſent for to ſee the Girl, who is now ſeven Years old. I found her in Bed, complaining extremely of a Head-ach attended with a Fever, a great *Catarrh*, and ſuch a Shortneſs of Breath, as if ſhe had had a *Peripneumonia*. She had been three Days in that Condition. I told the Mother, My Opinion was, ſhe ſhould be blooded preſently. To which ſhe readily conſented; telling me withal, That ſhe did not doubt but theſe were the Fore-runners of the ſame *Hæmorrhage* the Girl had before. This made me the more inſiſt upon the Opening of a Vein; but it being very late, it was put off till next Morning, and then indeed it was needleſs; for very early in the Morning, after ſome Convulſion-Fits, ſhe began to bleed from the Noſe, the Mouth, *&c.* When I came, it was almoſt over; I could only ſee a little bleeding from the Mouth; but all the People in the Houſe told me, they had ſeen the Blood drop from all theſe Parts. The Girl was then pretty well, without any Fever or Catarrh; ſhe could breathe freely, was in good Humour, and had a good Stomach; and ever ſince has continued in perfect Health. Now ſince the Returns are not ſo frequent, and the Symptoms are diminiſhed, I am in Hopes this may ſoon have an end; or at leaſt, 'tis very probable that theſe Accidents will totally ceaſe, whenever ſhe comes to have her *Catamenia*.

Of an Eruption *of* Blood *from ſeveral Parts of the* Body; *by Dr* A. Meſaporitus, *n.* 303. *p.* 2144.

2.] A very beautiful young Lady, of a good Family, who had enjoyed a good State of Health, and chearful Spirits, till the Age of Eighteen, after having ſuffered various other Complaints, was taken with a bleeding from very unuſual Parts, and at laſt with the worſt Kind of partial Sweats. She was firſt ſeized with a Senſe of Heavineſs, about the Time that the Menſes were expected to flow, and after a tedious Complaint of her Stomach, ſhe began to cough up Blood, occaſioned by a baſtard Pleuriſy, which began with her the *ninth* of *April* with a Fever, Pain in the Side, and Difficulty of Breathing. The *fourth Day* after ſhe was taken ill of this Diſeaſe, the Complaint in her Breaſt leaving her, ſhe was ſeized with a Pain in her Head, which ſhe had been troubled with before, and a bleeding at the Noſe without finding any Relief from it. The Surgeon who had bled her twice at the Arm in the Beginning of the Pleuriſy, and obſerved her Blood glutinous, to remove theſe two Complaints bled her plentifully at the Feet. But the Diſeaſe, which had ſufficient Matter to make further Progreſs, did not yield to this; on the contrary, ſhe had ſuperadded a Pain in her Stomach, whence a vomiting, firſt of a viſcid green Stuff, ſoon followed with Blood; nor was the Pain in her Head hereby relieved, but returning as it were by turns, the Hæmorrhage from the Stomach and Noſe continued for ſeveral Days. The reſtleſs Viciſſitude of the Symptoms plagued her ſtill extreamly, when, about the Beginning of *May*, the Menſes broke out, and in ſufficient Quantity as ſhe uſually had them. The Surgeon after the *ſeventh Day* gave her a Potion of Manna, and though it diſturbed her not a little, and ſeemed rather to make her worſe, yet ſoon after the Fever, which till then had always been more or leſs upon her, attended with watchings, entirely diſappeared. She had ſcarce had a Week's Reſpite from her Complaints, when ſhe was attacked again with the Fever, attended with Pains in her Joints, and eſpecially in her Belly, for which although ſhe took immediately the *Oil of Sweet Almonds*, extracted without Fire, yet ſhe was conſtantly preſſed with vomiting and Loſs of Blood.

In order to overcome this direful Symptom, the Phyſicians adviſed Blood to be taken in ſmaller Quantities, and at different Times from the *Salvatella*, applying Anodynes, Aſtringents, and ſeveral other Medicines, by turns. But though this Method was put in practice, the Diſeaſe was ſo irregular, that after the Hæmorrhage had gone through the more uſual Roads of the Excretions, it began to ſearch out very uncommon Paths for itſelf.

After the Blood, then in the Beginning of *June*, had flowed out at the Ears, it began ſoon to burſt, firſt from the Tops of the Fingers, and then from thoſe of the Toes; ſoon after this from the Navel, and the Corner of the Eye; then frequently in Sweats; next from the Middle of the Breaſt; afterwards from the Foot, and at that Part where we commonly open the *Vena Saphena*; at length from the Palms and Backs of both her Hands; two Days after from the Chin, and at Night from the Tip of the Tongue; ſo that in the Space of a Fortnight it had run through all theſe different Courſes, which are ſo various and ſingular as to appear really fabulous. Struck with the Novelty of the Diſeaſe, I went to viſit her, and was ſurprized to find her ſtill pretty ſtrong, and ſhe told me every Circumſtance very chearfully herſelf, her Account agreeing exactly with that I had heard from others. I could obſerve ſtill a little Cicatrix in the Palm of the left Hand, like an unequal Puncture, whence the Blood had iſſued the Day before, and ſhe told me that it occaſioned a diſagreeable Senſation, as it always did when it flowed from a particular Part; but when it was voided in form of Sweat from her Breaſt, or other Parts of her Body, it then left no Veſtige of the opened Pores remaining. In this Caſe her Linen was only marked with it, and I ſaw two of her ſhifts that were ſtained here and there to the Breadth of a Golden Shield, with a florid Blood. The fourteenth of *June*, the Menſes coming down upon her in greater Quantity than uſual, ſome People imagined that the Diſeaſe would thereby be removed, eſpecially as ſhe had had no Complaints for three Weeks before. But the bloody Sweats returning again, and continuing a long while, ſhe found herſelf weakened by it, and the Blood began to loſe it's wonted red Colour. Hence in order to refreſh her Spirits, and try what Effects the Change of Air might have upon her, ſhe went into the Country. But finding no Benefit from that, ſhe returned to Town the fifth of *Auguſt*, rather weaker than before, having, beſides what ſhe ſuffered from a cruel Diſeaſe, the Mortification to find, that after trying almoſt every thing that could be thought of, ſhe received no manner of Benefit. Thus the Diſeaſe continued, with very few Intervals, the Blood oozing out ſometimes at one Part, ſometimes at another, and frequently by Sweats, till the middle of *September*. After ſhe returned home, I went to viſit her, and as I ſtaid a long while talking with her, it happened, according to my Wiſh, that ſhe felt, by a pricking Pain in the Extremity of one of her Fingers, that an Hæmorrhage was a coming there, and I obſerved the Blood burſting out as from a deep Puncture, and preſently after it began to drop from another Part at a little Diſtance, and before I took my Leave, I ſaw a recent Stain of Blood in the Linen upon her Breaſt. Three Days after the bloody Sweats were ſurprizingly increaſed, and her Shift, where it covered her Breaſt, was painted with ſeveral Croſſes, and other Characters of the divine Paſſion. After this ſhe ſweated none at all, or very little. But I muſt not neglect to mention, that from a ſlight Excoriation above the Ancle, occaſioned by a falſe Step, there was ſuch a Quantity of a ſerous Humour ſupplied, that it was hard enough to ſtop it by means of Stypticks, and Compreſſes.

This extraordinary Caſe has puzzled a great many Phyſicians to account for it. *Fabricius Andiſonus* tells, that he formerly cured a Woman of thirty Years of Age, who had a Suppreſſion of the Menſes, and a Bleeding for a long while from the Angle of the Eye, only by bringing back the Menſtrua upon her. There are other Examples of the ſame kind related by Authors, as *Benivenius*, *Hollerius*, &c. But in all theſe Caſes there was ſome Obſtruction or other to be blamed, whence the Blood was forced beyond it's proper Limits. The preſent Caſe again muſt be accounted for in a different Manner; for here it is plain we have nothing to do with Obſtructions. What we are to conſider here, is, the attenuated Craſis of the Blood, whereby it's Colour appeared florid in the Beginning, and preſently after ſufficiently diluted. Nor is it to any Purpoſe to object here, that it was obſerved to be gelatinous in the Beginning, for this does not demonſtrate it's Subſtance to be thicker, but only a greater Ebullition of it's concreſcible Parts, as appears chiefly from this, that it was leſs during the Acceſſion of the Fever.

Of White Blood.

Several Years ago, being called to viſit a Nobleman's Daughter, who was very young, and ill of an acute Diſeaſe, I ordered her to be blooded; but inſtead of red Blood, there flowed out a white thin Serum, which after ſtanding ſome Time coagulated. But I do not deny that that Cauſe will not ſatisfy, and far leſs will it fully pleaſe, as adequate to the Diſeaſe, thoſe Interpreters of Nature, whom I leave to gueſs at a certain, and a Kind of inſenſible Diſpoſition of the red Blood. I have laid aſide this Study upon ſeveral Conſiderations, not only becauſe in Practice, we deceive ourſelves by turning our Thoughts upon Things that are leſs ſenſible, when the Patient is very ill; but becauſe *Anatomical Obſervations* plainly demonſtrate to us, that for the moſt Part there is ſomething remarkable found, which would never have entered into our Minds to conceive.

VII. I ſome Years ſince received an Account of a ſurprizing Illneſs, from the Perſon who had laboured under it: The ſame has been atteſted to me by his Wife and ſeveral of his Acquaintance.

An extraordinary Periodical Hæmorrhage *in the* Thumb; *by Dr* W. Muſgrave, *n.* 272. *p.* 864.

Mr *H*, formerly a Servant to Queen *Dowager*, of late to Mrs *Jennings* of *Burton* in *Somerſetſhire*, had (from his Infancy, as he has been informed, but) to his certain Knowledge, from as far back as he can remember, up to the twenty-fourth Year of his Age, a *Periodical Hæmorrhage* in one of his *Thumbs*.

The *Time* of the Eruption was about the Full of the Moon, ſeldom more than a Day before or after it: In the Orifice on the Right Side of the Nail of the Left Thumb. He has not known the Blood to be leſs in Weight at any one Periodical Diſcharge, than four Ounces; and is poſitive, that when he came to be ſixteen Years of Age, the Quantity was then increaſed to half a Pound at each Eruption; he and his Friends having often viewed the Quantity, and found it to be thus much.

The *Manner* of the Flux was alſo remarkable; for without any Pain of Head, Streightneſs of Breath, or any Signs of Fulneſs, or other Symptoms whatever obſerved by him, excepting only a Stiffneſs on the utmoſt Joint of the ſaid (Left) Thumb, the Blood uſed to ſpin out, with a conſiderable Force, on a ſudden, in ſeveral little Streams, and continue ſo to do, until the greater Part of the Quantity was diſcharged. Under this Diſcharge, however copious, he was ſtrong and vigorous to the Age of twenty-four, from his moſt early and tender Years.

At that Age (of 24) finding this Evacuation troubleſome, and being uneaſy under it, he ſeared with a hot Iron the Part which uſed to open and give Vent to the Flux of Blood. I ſaw that Part it was hard and callous to the Diameter of a quarter of an Inch. The Searing had ſtopped the Hæmorrhage for about twenty Years.

This Stoppage was in it's Effects very dangerous, and of ill Conſequence; for within one quarter of a Year after it, he fell into a *Sputum Sanguinis*; bringing up from his Lungs vaſt Quantities of Blood. This new Complaint, together with a Cough attending it, reduced him very low; ſo that Dr *Dike* thought him utterly loſt in a Conſumption; but by frequent Bleeding, *&c.* delivered him from this *Hæmoptoe*; yet not with that Relief which was expected: For in a very little Time the Patient fell into a moſt violent *Cholic*; from no other Occaſion (that he could diſcover) than his late Illneſs putting on a new Form, and the Matter ſettling on the Bowels.

This *Cholic* was, in good meaſure, overcome by purging Medicines: but a Diſpoſition to it ſtill remains; for he has ever ſince been often troubled with it (as alſo with a Spitting of Blood) on the leaſt Exceſs of Cold or Motion.

He has, ever ſince the Stoppage of the firſt Hæmorrhage, been weakly, ſickly; of a ſallow, faint Look; much impaired as to Health, in compariſon to what he enjoyed during the time of his Periodical Returns; and gives an Argument, *That when Nature has choſen, and for ſome Length of Time, exerciſed new and extraordinary Methods of Oeconomy, ſhe ſeems to be as fond of their Continuance, as, at other Times, and in her moſt regular State, ſhe is of that which is her moſt uſual and ordinary Courſe.*

There is a further Uſe to be made of this, and ſuch-like monthly Hæmorrhages, *in Men*; whether by the Thumb, (as in the preſent Caſe) or *per Penem*, (of which there have been in this Country two conſiderable Inſtances in my Time), or any other Part of the Body. For theſe Evacuations, being analogous to the *Menſes* in Women, confute the Opinion of all ſuch as derive that Diſcharge from a *Fermentum Uterinum*. For how can we think that the *Menſes* come from ſuch a local Ferment; when a Diſcharge, in all reſpects equivalent to them, takes Place, where no ſuch Ferment is, or can be ſuppoſed?

Of a Woman *who had the* Menſes *to* 70 *Years of Age*; *by Mr* J. Yonge. *n.*337. *p.* 236.

VIII. At *Lamerton*, 15 Miles from *Plymouth*, died lately a Woman of 86 Years old, who to the Age of 70 had her *Menſes* plentiful and regular. At that time they ceaſed; and ſoon after followed the like Efflux from the *Hæmorrhoids*, which continued 'till ſhe was paſt fourſcore.

She was till then healthful and ſtrong, of a vigorous Aſpect, ſmooth, plump, and florid in Countenance, like one not half ſo old: Her Appetite was very good; her Intellects clear and ſound; and her Sight ſo perfect, that ſhe could to the laſt thread a Needle, and read a ſmall Print without Glaſſes.

When that Flux ceaſed, ſhe became Gouty; and about one Year before ſhe died, there aroſe an Apoſthumation in one of her Wriſts, which opened and diſcharged much chalky Matter, and ſome Stones. The Day ſhe died, ſhe roſe out of her Bed, and, after performing her Devotions, expired

She was never ſick before the Hæmorrhoidal Flux ſtopped, except once at *Exeter* (where ſhe was born, and then lived) ſhe became infected with what they call the *Plague*: It ended in a critical Abſceſs in one of the Emunctories; and, which is very ſtrange, during all the time of that Sickneſs, ſhe nurſed a Male Child, who is yet alive, and one of our Faculty, from whom I have this Relation.

Of a Perſon who had a New *Set of* Teeth *after* 80 *Years of Age: And of the* Virtues *of* Sugar; *by Dr* F. Slare. *n.* 337. *p.* 273.

IX. I have had Reaſon to give a great Character of *Sugar*, on account of ſome extraordinary Effects it ſeemed to have on my Grandfather 40 Years ſince: He made it his daily Practice to take as much Sugar as his Butter ſpread upon Bread would receive, for his conſtant Breakfaſt, unleſs he happened to exchange it for Honey ſometimes. He frequently ſweetened his Ale and Beer with Sugar: He had Sugar put to all the Sauces he uſed with his Meat. He had all his Teeth in his Mouth at 80 Years, ſtrong and firm; never had any Pain or Soreneſs in his Gums or Teeth; never refuſed the hardeſt Cruſt. In his 82d Year one of his Teeth dropped out, and after that a ſecond, which he put into my Hand, and was one of the Fore-Teeth: He bid me feel the Cavity, where I ſtruck my Nail upon a Bone. In ſhort, all his Teeth came out in two or three Years, and the young ones filled up their Room: He had a new Set quite round: His Hair, from a very candy'd white, became much darker. He continued in good Health and Strength, without any Diſeaſe, and died in his 99th or 100th Year of a *Plethora*, as I gueſs, for want of Bleeding. This reconciled me much to vindicate *Sugar*, and to ſhew that Dr *Willis* has unjuſtly charged it with a corroſive Liquor as bad as *Aqua fortis*: I examined it, and found the Charge unjuſt; That Sugar contained no worſe Subſtance in it than Milk, and Honey, and Manna, nay, even Bread itſelf. I have been ſome Time in finding the Figure which Sugar will ſhoot into: For the Difficulty lies here; all other Salts ſhoot or cryſtallize, and make their Figure in a cool Place; but Sugar will cryſtallize only in a hot Stove, and is more apt to be compounded, and not to ſhew it's true primitive Texture: Thus it happens to Snow, which in it's true ſimple Shape is an Hexagon; but cannot be always diſcovered ſingle. This is yet more eaſy to be accounted for than Snow; and we have been able to chuſe ſuch Paarcels of that Sugar called Candy, as do repreſent the following Figure, being a Priſm, I never queſtioned but that it was a true Salt, having all the Properties of a Salt.

Fig. 192.

Fig. 192, *ſhews the Form of the* Cryſtals *or* Salts *of* Sugar, *having two* Baſes, *oppoſite, equal, and parallel; the other are Parallelograms.*

Fig. 193.

Fig. 193, *ſhews the* Baſis *of the preceding Figure.*

Of an extraordinary ſleepy *Perſon; by Dr* W. Oliver. *n.* 304. *p.* 2177.

X. *May* the 13th, *Anno* 1694, one *Samuel Chilton* of *Tinsbury* near *Bath*, a Labourer, about 25 Year of Age, of a robuſt Habit of Body, not fat, but fleſhy, and a dark-brown Hair, happened, without any viſible Cauſe, or evident Sign, to fall into a very profound Sleep, out of which no Art uſed by thoſe that were near him could rouze him, 'till after a Month's time; then roſe of himſelf, put on his Cloaths, and went about his Buſineſs of Huſbandry as uſual; ſlept, could eat and drink as before, but ſpake not one Word till about a Month after. All the time he ſlept, Victuals ſtood by him: His Mother fearing he would be ſtarved, in that ſullen Humour, as ſhe thought it, put Bread and Cheeſe, and Small-Beer before him, which was ſpent every Day, and ſuppoſed by him, tho' no one ever ſaw him eat or drink all that time.

From this time he remained free of any Drowſineſs or Sleepineſs 'till about the 9th of *April* 1696, and then fell into his Sleeping Fit again juſt as he did before. After ſome Days they were prevailed with to try what Effect Medicines might have on him; and accordingly one Mr *Gibs* an Apothecary went to him, bled, bliſtered, cupp'd, and ſcarified him, and uſed all the external irritating Medicines he could think on; but all to no Purpoſe, nothing of all theſe making any Manner of Impreſſion on him; and after the firſt Fortnight he was never obſerved to open his Eyes. Victuals ſtood by him as before, which he eat of now and then, but no-body ever ſaw him eat or evacuate, though he did both very regularly, as he had occaſion; and ſometimes they have found him faſt aſleep with the Pot in his Hand in Bed, and ſometimes with his Mouth full of Meat. In this manner he lay for about ten Weeks, and then could eat nothing at all; for his Jaws ſeemed to be ſet, and his Teeth clinched ſo cloſe, that with all the Art they had with their Inſtruments they could not open his Mouth, to put any Thing into it to ſupport him. At laſt, obſerving a Hole made in his Teeth, by holding his Pipe in his Mouth, they, through a Quill, poured ſome Tent into his Throat now and then: And this was all he took for ſix Weeks and four Days, and of that not above three Pints, or two Quarts: He had made Water but once, and never had a Stool all that time.

Auguſt the 7th, which is ſeventeen Weeks from the 9th of *April*, (when he began to ſleep) he awaked, put on his Cloaths, and walked about the Room, not knowing he had ſlept above a Night: Nor could he be perſuaded he had lain ſo long, 'till going out into the Fields, he found every Body buſy in getting in their Harveſt; and he remembered very well, when he fell aſleep, they were ſowing of Barley and Oats, which he then ſaw ripe, and fit to be cut down.

There was one thing obſervable, That tho' his Fleſh was ſomewhat waſted with ſo long lying in Bed, and faſting for above ſix Weeks, yet a Gentleman his Neighbour aſſured me, when he ſaw him, which was the firſt Day of his coming abroad, he looked briſker than ever he ſaw him in his Life before; and aſking him whether the Bed had made him ſore, he aſſured him, and every Body, that he neither found that, nor any other Inconveniency at all; and that he had not the leaſt Remembrance of any thing that paſſed or was done to him all that while. So he fell again to his Huſbandry as he uſed to do, and remained well from that time till *Auguſt* the 17th, *Anno* 1697, when in the Morning he complained of a Shivering and Coldneſs in his Back, vomited once or twice, and that ſame Day fell into his Sleeping Fit again.

Being then at *Bath*, and hearing of it, I went on the twenty-third to inform myſelf of the Matter of Fact. When I came to the Houſe, I was by the Neighbours (for there was no Body at Home at that time beſides the ſick Man) brought to his Bed-ſide, where I found him aſleep, as I had been told before, with a Cup of Beer and a Piece of Bread and Cheeſe upon a Stool by his Bed within his Reach. I took him by the Hand, felt his Pulſe, which was at that time very regular; I put my Hand on his Breaſt, and found his Heart beat very regular too, and his Breathing was eaſy and free; and all the Fault I found, was, that I thought his Pulſe beat a little too ſtrong: He was in a breathing Sweat, and had an agreeable Warmth all over his Body. I then put my Mouth to his Ear, and, as loud as I could, called him by his Name ſeveral times, pulled him by the Shoulders, pinched his Noſe, ſtopped his Mouth and Noſe together, as long as I durſt, for fear of choaking him, but all to no Purpoſe; for in all this time he gave me not the leaſt Signal of being ſenſible. I lifted up this Eye-lids, and found his Eye-balls drawn up under his Eye-brows, and fixed without any Motion at all. Being baffled with all theſe Trials, I was reſolved to ſee what Effects *Spirit* of *Sal Armoniac* would have, which I had brought with me, to diſcover the Cheat, if it had been one; ſo I held my Phial under one Noſtril a conſiderable time, which being drawn from Quick-lime, was a very piercing Spirit: Then I threw it, at ſeveral times, up that ſame Noſtril; it made his Noſe run and gleet, and his Eye-lids ſhiver and tremble a very little; and this was all the Effect I found, though I poured up into one Noſtril about a half Ounce Bottle of this fiery Spirit, which was as ſtrong almoſt as Fire itſelf. Finding no Succeſs with this, I crammed that Noſtril with Powder of *White Hellebore*, which I had by me, in order to make farther Trials; and I can hardly think any Impoſtor could ever be inſenſible of what I did. I ſtaid ſome time afterwards in the Room, to ſee what Effects all together might have upon him; but he never gave any Token that he felt what I had done, nor diſcovered any manner of Uneaſineſs, by moving or ſtirring any one Part of his Body, that I could obſerve. Having made theſe my Experiments, I left him, being pretty well ſatisfied he was really aſleep, and no ſullen Counterfeit, as ſome People thought him.

Upon my Return to *Bath*, and relating what I had obſerved, many Gentlemen went out to ſee him, as I had done, to ſatisfy their Curioſity, who found him in the ſame Condition I had left him in the Day before; only his Noſe was inflamed and ſwelled very much, and his Lips and the Inſide of his right Noſtril bliſtered and ſcabby, with my *Spirit* and *Hellebore*. His Mother, for ſome time after, would ſuffer no Body to come near him, for fear of more Experiments upon her Son.

About ten Days after I had been with him, Mr *Woolmer*, an Apothecary at *Bath*, called at the Houſe, being near *Tinsbury*, went up into the Room, finding his Pulſe pretty high, as I had done, takes out his Launcet, lets him Blood about fourteen Ounces in the Arm, ties his Arm up again, no Body being in the Houſe, and leaves him as he found him; and he aſſured me he never made the leaſt Motion in the World when he pricked him, nor all the while his Arm was bleeding.

Several other Experiments were made by thoſe that went to ſee him every Day from the *Bath*, but all to no Purpoſe, as they told me on their Return: I ſaw him myſelf again the latter end of *September*, and found him juſt in the ſame Poſture, lying in his Bed, but removed from the Houſe where he was before about a Furlong or more; I found now his Pulſe was not quite ſo ſtrong, nor had he any Sweats, as when I ſaw him before. I tried him again the ſecond time, by ſtopping his Noſe and Mouth, but to no purpoſe; and a Gentleman ran a large Pin into his Arm to the very Bone, but he gave us no manner of Tokens of his being ſenſible of any thing we did to him. In all this time they aſſured me no Body had ſeen him either eat or drink, tho' they endeavoured it all they could, but it always ſtood by him, and they obſerved ſometimes once a Day, ſometimes once in two Days, all was gone. 'Tis farther obſervable, he never fouled his Bed, but did his neceſſary Occaſions always in the Pot.

In this manner he lay till the 19th of *November*, when his Mother hearing him make a Noiſe, ran immediately up to him, and found him eating; ſhe aſked him how he did? He ſaid, Very well, thank God: She aſked him again, Which he liked beſt, Bread and Butter, or Bread and Cheeſe? He anſwered, Bread and Cheeſe; Upon this, the Woman over-joyed left him, to acquaint his Brother with it; and they came ſtraight up into the Chamber to diſcourſe him, but found him as faſt aſleep again as ever, and all the Art they had could not wake him. From this time to the End of *January*, or the Beginning of *February*, he ſlept not ſo profoundly as before; for when they called him by his Name, he ſeemed to hear them, and be ſomewhat ſenſible, tho' he could not make them any Anſwer. His Eyes were not now ſhut ſo cloſe, and he had frequently great Tremblings of his Eye-lids, upon which they expected every Day when he would wake, which happened not till about the time mentioned, and then he waked perfectly well, not remembering any thing that happened all this while. 'Twas obſerved he was very little altered in his Fleſh, only complained the Cold pinched him more than uſually, and ſo preſently fell to Huſbandry as at other times.

I have no Reaſon to ſuſpect this to be a Cheat, becauſe I never heard of any Gain to the Family by it, tho' ſo near the *Bath*, and ſo many People went thither out of Curioſity to ſee the Sleeper; who when awake was a Support to his old Mother by his Labour, but now a certain Charge to her. Beſides, there was ſeldom any Body in the Houſe to attend any Profit that might be made by it, he being left alone in the Houſe, and every Body at Liberty to go up to his Bed-ſide.

Of a great Quantity *of* Opium *taken without cauſing* Sleep. *n.* 275. *p.* 999.

XI. There happened at *Newberry* a very remarkable Caſe of one Mrs *Lovelock*, who had been ill of a Fever from the 17th of *January*; which affected her ſo, as to make her light-headed to a great Degree, convulſed and reſtleſs; upon which the Phyſicians agreed to give her great Quantities of Opiats, in order to compoſe her; but, with the Doſes below atteſted, they could never procure any thing like Sleep; but ſtill as ſhe took them they ſeemed to refreſh her, and make her ſenſible, but cauſed nothing of Reſt. And the Women about her began at laſt to ſcruple her taking any more, upon a Notion they had, that, by the Effects, this Medicine was too high a Cordial for her, and ſtill kept her waking; upon which the Phyſicians were forced to alter the Form. The Quantity ſhe took from *Tueſday* Night twelve o' Clock to *Friday* Night twelve o'Clock was as follows. *Jan.* 29, 4 Bolus's with 2 Grains each of *Laud. Lond.* made up in the *Venice* Treacle. 6 Pills, with 2 Grains each of the ſame. A Bolus with 8 Grains of the ſame in *Ven.* Treacle. *Jan.* 30. Twelve Pills with 2 Grains each, and one Bolus with 10 Grains of the ſame in *Venice* Treacle. *Jan.* 31. 4 Draughts with 10 Grains of the ſaid *Laud. Lond.* one Ounce of *Syr. de Mecon.* in each Draught. So that in all ſhe took in the time abovementioned 102 Grains of *Laud. Lond.* and ʒiij of *Venice* Treacle, and ℥iiij of *Syr de Meconio.*

This is atteſted under the Hands of her three Phyſicians, and the Apothecary.

Dr *Franc. Willis* of *Oxford.*
Dr *Step. Flavell.*
Dr *John Cooke.* } *Newberry.*
Ri. Fanner, Apoth.

Signed in the Preſence of
Rich. Smith.
Rich. Spicer.
Robert Greenham.

She died the 1ſt of *Febr.* about 5 in the Afternoon.

Of a Deaf *and* Dumb *Perſon recovering his* Speech *and* Hearing *after a* Fever; *by Mr* M. Martin. *n.* 312. *p.* 1469.

XII. *Daniel Fraſer*, a Native of *Strabarig*, ſome ſix Miles from *Inverneſs*, continued Deaf and Dumb from his Birth, 'till the ſeventeenth Year of his Age. The Counteſs of *Crawford* kept him in her Family for the ſpace of eight or nine Years: After ſeventeen Years he was taken ill of a violent Fever, but being let Blood, his Fever abated, and had not it's natural Courſe: About five or ſix Months after, he contracted a Fever again, and had no Blood drawn from him; and this went on with it's natural Courſe. Some Weeks after his Recovery he perceived a Motion in his Brain, which was very uneaſy to him, and afterwards he began to hear, and in Proceſs of time to underſtand Speech; this naturally diſpoſed him to imitate others, and attempt to ſpeak: The Servants were much amazed to hear him; he was not underſtood diſtinctly for the Space of ſome Weeks: he is underſtood now tolerably well, tho' he yet retains the *Highland* Accent, as *Highlanders* do who are advanced to his Years before they learn the *Engliſh* Tongue: he can ſpeak no *Iriſh*, for it was in the *Low-Lands* of *Scotland* that he firſt heard and ſpoke.

An Account of a Woman who had lain covered with Snow *ſix* Days *without any* Nouriſhment; *by* Mr S. Bowdich. *n.* 337. *p.* 265.

XIII. *Joanna Crippen* of *Chardſtock* in *Dorſet*, going from thence on the 24th of *January*, 1708-9. (being *Chard* Market) to her Maſter's for Work, ſhe being a Spinner of Yarn or Worſted, and coming Homeward with ſome of her Neighbours, it ſnowing very hard, and being very deep, was forced into a poor Cottage for Shelter, deſiring ſhe might abide there in the Chimney-corner for that Night, offering a Penny to the Woman of the Houſe, which ſhe refuſed. The Perſons that came with her, went to their reſpective Places of Abode, which were not far from the Place where ſhe begged to lie; ſo that ſhe was alone, and had almoſt a Mile thence to her own Home; having no manner of Suſtenance with her, only a quarter of Tobacco, a Pound of Worſted Yarn, and three Pence in Copper, not ſo much as a Bit of Bread, Biſket, or the like. And being forced out of this Place, was conſtrained to travel, as well as a poor tired Creature could, towards her own Home; but going not far from thence, was met with by a Man of our Pariſh; who ſeeing her tumbling in the Snow a Diſtance off, as he was going to his Home, and finding her lying in a Ditch, helped her up, and bid her obſerve to go in his Track, which he obſerved ſhe did indifferently well. But ſhe had not gone a quarter of a Mile before ſhe was forced to lie down under a Hedge, having loſt one of her Shoes; and her Cloaths, which were very mean, were with the Brambles and Thorns torn almoſt quite off her Back: In which Place ſhe lay from *Monday* Evening about Six o'Clock, until *Sunday* following about Four in the Afternoon, and then was diſcovered by ſundry of our Neighbours, who went out with Poles, Shovels, *&c.* to ſearch for her; and after ſome time ſpent in it, at laſt found her buried in four Foot of Snow or thereabouts, it being more than ſo much higher before the Thaw. One of the Men with his Pole thruſting at her, cried out, She was there; then the reſt advanced up; and opening the Snow, one of the Men ſaid, She was alive. She immediately ſpoke, and begged he would not poot her too hard, (as ſhe expreſſed it) for ſhe was almoſt naked; and deſired that ſome of the Women would come to her and take her forth, which accordingly was done; they finding her without Stockings or Shoes, an old Whittle about her Shoulders, with a large Hole in it, which ſhe had eat thro'; the Snow melting down on her, which ſhe drank to quench her Thirſt. From thence ſhe was brought near my Habitation, where the beſt Care has been taken of her. She had a Mortification on one of her great Toes, which now is in a good way of

Recovery; and now ſhe is very hearty and in a fair way of a perfect Recovery.

She was very ſenſible at the firſt taking her out, and ſtill continued ſo; knowing every Body perfectly well. Her Tobacco and Three-pence were in her Pocket. She had no manner of Food with her, as Bread, or any Eatable whatſoever. I have been concerned with her ever ſince ſhe was brought hither. This Story, however ſtrange it may ſeem, is in every Particular true, as will more plainly appear from a Narrative ſubſcribed by two neighbouring Miniſters, Church-Wardens and Overſeers, with many others who were preſent at the finding her, which I ſuppoſe will ſoon be printed.

An Account of the prodigious Scurvy *at* Paris, 1699; *by Mr* Poupart. *Extracted from the* Memoirs *of* Hiſt. Acad. Scien. *n.* 318. *p.* 223.

XIV. The Adminiſtrators of the *Hôtel Dieu*, having been informed of the vaſt number of Scorbutic Perſons, which came daily into that Houſe, or were brought there, as alſo of the ſtrange Symptoms, and dangerous Conſequences of this *contagious* Diſtemper, gave Orders for their being removed to the Hoſpital of St *Lewis*, the ſecond Day of *March*, where many of them continued till the End of *Auguſt* in the ſame Year.

I went to the Hoſpital of St *Lewis*, to make my Obſervations on it; and ſoon perceived, that this Diſtemper had ſomething in it of that *Plague*, with which the * *Athenians* formerly were afflicted.

The Diſeaſe was yet a true Scurvy; for they, who were ſick of it, felt, as common Scorbutic Perſons do, Pains in their Thighs, the Calves of their Legs, their Belly and Stomach, and were deprived of the Motion or Uſe of their Limbs, though they ſtill retained their Feeling. They were troubled with Head-achs, Convulſions, and ſuch ſtrange Itching in the Gums, that the Children pulled off certain Pieces of them with their Nails. The Blood, which came from them, was watery, ſalt, and corroſive; and the Stink, which came from their Mouth, was intolerable. They had hard blue Spots on their Legs and Thighs, frequent Hæmorrhages, or Bleedings at the Noſe and Fundament, and alſo ſo great Weakneſs in their Knees, that they could not go without reeling or ſtaggering. Theſe were the Symptoms which they had in common with other Scorbutic Perſons: What they had in particular, were,

When we removed theſe ſick Perſons, we heard a ſmall Clattering of their Bones, which Particular Mr *N. V.* hath mentioned in his *Treatiſe of the Scurvy*.

I obſerved at the opening of all thoſe Bodies or Cadavers in which we heard the aforeſaid little Noiſe, that the *Epiphyſes* were entirely ſeparated from the Bones, which by rubbing againſt each other, occaſioned this Clattering.

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* *Lucret. lib.* 6.

We have opened ſeveral young Perſons, in whom we alſo perceived a ſmall low Noiſe when they breathed. In all theſe Sorts of Bodies we found that the Griſtles of the *Sternum* were ſeparated from the bony Part of the Ribs; and as the Griſtles are of a ſofter Subſtance than the *Epiphyſes*, the Noiſe, which their rubbing produced, was greater than that of thoſe Bones which rubbed againſt the *Epiphyſes*.

They, in whom we heard this Noiſe at the time when they breathed are all dead, except one young Man, whoſe Ribs were viſibly reunited to the Griſtles; for after his Cure, we heard no more of this Noiſe.

All thoſe, in whoſe Breaſts any Matter or Seroſity were found, had their Ribs ſeparated from their Griſtles, and that bony Part of thoſe Ribs which were over-againſt the *Sternum*, was rotted for the length of four Fingers; which is an Evidence that the *Lympha* of theſe Bodies was extremely cauſtic.

The greateſt Part of thoſe Bodies which were opened, had their Bones black, Worm-eaten, and rotten.

Moſt of the ſick went ſtaggering: This is an Accident common to Scorbutic Perſons; the Reaſon of it is, that the Support of the Joints proceedeth from the Force and Spring of the Ligaments, which bind the Bones cloſe to each other; the Ligaments of theſe ſick Perſons were corroded, looſe, and the Bones were ſeparated from each other; which proceeded from this, That inſtead of finding in their Joints that ſweet Oily *Lympha* (which commonly aboundeth there, in order to make the Joints ſupple, and give them an eaſy free Motion) there was nothing but a greeniſh Water, which, by it's over-cauſtic Quality had corroded the Ligaments, and conſequently deſtroyed the Force of their Spring.

All the young Perſons under eighteen, had in ſome Degree their *Epiphyſes* ſeparated from the Body of their Bones, and by the leaſt Endeavour or Force we ſeparated them entirely. The Reaſon of it is this, that young Perſons have not yet their *Epiphyſes* ſo ſtrongly faſtened to the Bones, ſo that when they are never ſo little ſoaked with that corroſive *Lympha* which is in the Joints, that cauſtic Liquor may eaſily ſeparate them entirely from the Bones.

All the Bones which we found entirely ſeparated from their *Epiphyſes*, were more than twice as big as they ſhould be in their natural State; becauſe theſe *Epiphyſes* were ſeparated in them only, whoſe Bones were well ſoaked with a Water which had penetrated into their very Subſtance, and made it ſwell.

The Bones of thoſe which recovered, or were recovering, remained ſwelled, without giving them any Pain. They might grow leſs in time, as it happens to Children which are troubled with the Rickets, whoſe Bones grow dry by little and little as they grow up.

All they who had any Difficulty in Breathing, or had their Breaſts ſtuffed or ſtopped up, had there good Store of *Lympha*, or Matter;

and we often found more or leſs of them in their Lungs, according as they were oppreſſed.

We have ſeen ſome ſick Perſons, whoſe Breaſts have been ſo oppreſſed, that they died all on a ſudden; in the mean while we found no Seroſity, neither in their Breaſts, nor in their Lungs: But the *Pericardium* was entirely faſten'd to the Lungs, and the Lungs were glued to the *Pleura* and *Diaphragm*; and all the Parts were ſo mixed and blended together and confounded, that one could ſcarce diſtinguiſh the one from the other: Now as the Lungs were ſqueez'd together in the midſt of this Maſs, they were depriv'd of their Motion, and the ſick Perſon was choak'd for want of Breath. The cloſe Adheſion and Confuſion of theſe Parts one with another, proceeded from this, that being ulcerated as they were, they muſt needs ſtick to each other.

The ordinary or common Scorbutic Perſons have the Glands of their Meſentery much obſtructed and ſwell'd; thoſe we treat of, had theirs partly corrupted, and Impoſthumes in the Subſtance of it.

In the Liver of ſome few, the Matter or Corruption was harden'd, and as it were petrified; their Spleen was three times bigger than it ſhould be, and fell to pieces as if it had been compos'd of coagulated Blood: and ſometimes the Kidneys and the Breaſt were full of Impoſthumes.

There were ſome Bodies or Cadavers of thoſe of Fifteen, in which if we ſqueez'd betwixt two Fingers the End of the Ribs, which began to be ſeparated from the Griſtles, there came abundance of corrupted Matter, which was the ſpungy Part of the Bone; ſo that after the ſqueezing of it together, there remain'd nothing of the Rib, but two bony Plates.

We have ſeen ſome who had no other Token of the Scurvy, but ſome ſlight Ulcerations in the Gums: They had afterwards ſome ſmall, red, hard Tumours on their Hands, their Inſteps, and in ſome other Parts of the Body. After that, there appeared large Impoſthumes on their Groin, and under their Arm-pits, attended with ſeveral blue Spots over all their Body, which were the certain Forerunners of Death. We found that the Glandules under their Arm-pits were very big, and ſurrounded with Matter or Corruption; as well as the Muſcles of their Arms and Thighs, whoſe Intervals were all filled with them.

We obſerv'd ſome whoſe Arms, Legs, and Thighs were of a reddiſh Black, and as it were burnt; which proceeded from that black and coagulated Blood, which we always found under the Skin of thoſe Perſons. We alſo found their Muſcles ſwell'd, and as hard as Wood; which proceeded from the Blood, which was fix'd in the Body of the Muſcles, which were ſometimes ſo full of it, that their Legs remained bent without being able to extend or ſtretch them out.

We obſerved that the blue, red, yellow, and black Spots, which appear in their Bodies who have the common Scurvy, proceed purely from extravaſated Blood under the Skin. As long as the Blood kept its red Colour, the Spot was red; if the Blood is black or coagulated, the Spot is alſo black; when there is ſome Bile mix'd with it, the Spot is of a yellowiſh Black; in ſhort, according as the Blood is mixed with the Humours of different Colours, ſo alſo the Spots appear of a different Colour.

We ſometimes ſaw on the Bodies of theſe Perſons certain ſmall Tumours, which grew bigger every Day: We applied emollient Ointments to ſoften them; and thoſe Tumours, on their breaking, form'd a Scorbutic Ulcer, which proceeded from the Blood with which the Tumour was filled; for as often as we took off the Plaiſter, we ſtill found under it a great deal of coagulated Blood; we put on a freſh Plaiſter, and ſome time after we ſtill found under it coagulated Blood: We continued dreſſing of them after this manner, and by thus taking away the Blood, we entirely dried up the Tumour, and the Perſon was cured. Some old Perſons had ſuch large Bleedings at the Noſe and Mouth, that they died of it; it being impoſſible to ſtop it, becauſe the *Lympha* of theſe Perſons was ſo ſharp and corroſive, that it corroded and eat through the Coats of the Veins. And this kind of Hæmorrhage was ſo much the harder to ſtop, becauſe the Blood of old Perſons, is more fluid and watery than that of young Perſons who are ſeldom ſubject to this Accident.

Old Perſons, as well Women as Men, were troubled with ſuch mighty Fluxes, that the weakeſt of them died under them; but if they had Strength enough to withſtand them, they were ſoon cured.

There were ſome of theſe ſick Perſons, who were ſo coſtive in their Body, that they never could go to Stool, without taking ſome Gliſters.

Several of them had ſuch large Swellings over all their Bodies, their Hands, Arms, and Feet, that they ſeemed to have been blown up. We cured ſeveral of them by proper Medicines, Gliſters, and ſweetning Juleps.

A Youth of ten Years old, had his Gums much ſwelled and ulcerated; his Teeth were eaten up to the Roots of them, and his Breath was intolerably ſtinking. The Chirurgeon was oblig'd to pull out all his Teeth, for the better dreſſing his Mouth; tho' they would have fallen out of themſelves: His Gums were heal'd, but there aroſe a Tumour on the Side of his Tongue as big as a Walnut. In the middle of this Tumour there was a bluiſh Hole, which degenerated into an Ulcer, which eat up half the Tumour, the other half remained whole and entire. Some ſmall time after, there appear'd another Tumour in the Cheek, which was very hard: It was blue in the middle, and turn'd to an Ulcer alſo as the firſt. This Youth died all on a ſudden, when it was leaſt expected, and all the inward Parts of his Body were corrupted.

All they who died ſuddenly, without having any viſible Cauſe of their Death, had the Auricles of their Heart as big as one's Fiſt, and full of coagulated Blood, which by putting a Stop to the Circulation of the Blood, brought an inevitable Death on them.

There came in the Cheeks of ſeveral a ſmall white Ulcer, which was hard all round; unleſs we took care to ſtop it preſently, and to take it off with the Spirit of Vitriol, it grew preſently livid or blue, black and ſtinking, and eat up Part of the Cheek, ſo that one might ſee the Teeth through it.

We have ſeen ſeveral from the Age of eighteen to the Age of thirty, who were without Pain, caſt down, ſtupid, and without any Motion. They had their Mouths open, their Eyes ſunk in, their Looks frightful, and appear'd rather like Statues than Men.

All theſe Perſons had no apparent Sickneſs, only their Gums were ulcerated; their Skin was ſmooth and fair, without any Spots or Hardneſs: Yet we found their Muſcles were gangren'd, and all wet with a black corrupted Blood; and in handling of them, they fell into pieces in our Hands.

There was a Man who had a Carbuncle on his Inſtep, his Lips and his Noſtrils were chopp'd, and a ſtinking Water flow'd gently from his Noſtrils. This Man linger'd out a long time in a dying Condition.

A young Man, who as to all outward Appearance ſeem'd not to be very ill, died ſuddenly. We found his *Pericardium* was ſo eaten up, that there remain'd but a little of it, and his Heart was ulcerated all about very deeply.

Scorbutic Perſons are commonly better in the Summer than they are in the Winter, which may proceed from their great Tranſpiration. On the other ſide, theſe were indifferently well from the Month of *April* to the beginning of *June*, the Spots, Hardneſs, and other Accidents of the Scurvy then diſappearing; but on the coming of the great Heats, all thoſe Accidents return'd. They who were ſo well as to be in a readineſs to quit the Hoſpital, relaps'd again; their Legs and Thighs grew all black, and Death often put a Period to their Miſeries. This Diſorder might arrive from this, that there was ſuch a great Quantity of corroſive *Lympha* in them, that it was in a manner impoſſible for it to be carried off by Tranſpiration, ſo that by ſtagnating in their Bodies it grew hot, fermented, ſour, and putrified; from thence aroſe thoſe Corroſions, Ulcers, and great Impoſthumes, Corruptions, and other Accidents, which we ſpoke of before.

All theſe eat very heartily to the laſt Moment of their Life; this proceeded from a ſharp Humour, with which their Stomach always abounded, which created in them a kind of *Fames canina*.

Nothing is ſo apt to corrupt the Blood as long Want; the Uſe of ill Food is ſtill worſe; Cold ſtops the Circulation of the Blood, and makes the Blood remain too long in the Parts, where it ſours and ſoon corrupts; Sadneſs and Grief (which theſe were ſubject to) is worſe than all the reſt; and what all theſe may do when they meet all together in one Perſon, we may eaſily judge. They produced there *Lympha's* of different Colours, with which the Belly, the Breaſt, and ſeveral other Parts of their Bodies were fill'd. Thoſe *Lympha's* were ſo cauſtic, that having put our Hands into their *Cadavers*, the Skin of them came off, and our Faces were thereby ulcered; ſo that we were obliged to riſe in the Night to waſh our Face with freſh Water, to take off the Heat and Inflammation of it.

But that which was very ſurpriſing in this great Diſeaſe was, that the Brains of theſe poor Creatures were always very ſound and entire.

An Account of a Calenture, *by Dr.* W. Oliver. *n.*290. *p.* 1562.

XV. In the Month of *Auguſt* 1693, I was called upon about four o'Clock in the Morning, to ſee a Sailor on board the *Albemarle* Man of War, in a violent *Calenture*. He was between 30 and 40 Years of Age, brown hair'd, pretty tall, but thin, and had not much Fleſh about his Bones. When I ſaw him firſt, I found him in the Hands of three or four of his Comrades, who were hardly able to manage him, becauſe of his Strugglings and conſtant Endeavours to get from them. I obſerv'd he very often cry'd out, he would go into the green Fields; his Looks were as furious and wild as thoſe of a Lion, and every now and then he would heartily curſe thoſe that held him. I examin'd his Pulſe, and felt a diſorderly Motion of the Blood in the Artery, and a burning fiery Heat all over his Body, but cou'd perceive no Diſtinction or Vibration of Pulſe at all. The Surgeon of the Ship had, before I came, attempted to bleed him; but though the Vein of the Arm was fairly open'd, yet cou'd he not procure an Ounce of Blood from thence. Upon that I order'd him to open the frontal Vein, which ſucceeded no better, for that ſoon ſtopp'd too. This put me upon trying a third time, what Effects the opening the Jugular Vein might have. From this Vein, though our Orifice was pretty large, we had about two Ounces of florid thick Blood, and then it quite ſtopp'd there too. I then order'd the Surgeon to unbind his Arm, and try whether he could make him bleed again at that Orifice, which I remember he did in a ſmall Quantity, and then it ſtopp'd as before. However, having three Orifices open at that time, we drew Blood ſometimes from one, and ſometimes the other, where we ſaw it run moſt freely. After ſeveral Eſſays of this kind, I always obſerved, as the Veſſels emptied, he bled more freely, and at laſt as faſt as I deſired.

I was all along of Opinion, we ought to continue his bleeding 'till we ſaw ſome viſible Alterations, and conſiderable Abatements of his Symptoms, which happen'd in about half an Hour's time after I ſaw him, and then I felt his Pulſe again, which now began to beat diſtinctly, but very quick. Not long after this, for he bled well enough now, I obſerv'd his Strugglings were not ſo ſtrong, his Ravings and crying after green Fields left off, his wild Looks much abated, and not only his Pulſe had recovered its due and regular Vibrations, but his Heats were moderated too, and the Fury of his Spirits laid to that Degree, that he that juſt now was as furious as a Lion, was grown ſo tame, that one Man was able eaſily to manage him. In this half Hour, as near as we can gueſs, we took from him about fifty Ounces of Blood from the three Orifices mention'd; ſo I order'd him to his Hammock, as ſoon as we had ſecured the Orifices from bleeding again, and directed the Surgeon to give him an Ounce of Diacodium in a Draught of Barley Water, as he went into it: Upon this he ſlept 'till about Noon, when he awaked with no other Complaint, but of Weakneſs from his loſs of Blood, and a Soreneſs all over his Body, occaſion'd, I preſume, from his violent Convulſions and Endeavours to get looſe.

This was the only Calenture I ſaw all the while I was in the Fleet for near three Years, two Summers of which I ſerv'd in the *Mediterranean*, and this happen'd in the *Bay* of *Biſcay*, in the Latitude of 47, in the Month of *Auguſt*. They are, I hear, more frequent in warmer Climates, tho' very often undiſcover'd.

The Reaſon I imagine to be this: When they are ſeiz'd with this violent Heat and Diſorder, which for the moſt part happens in the Night, they ſteal privately over-board into the Sea, imagining they are going into the green Fields: And this I take to be the Reaſon we ſee ſo few; tho' I have heard frequently in the *Mediterranean* in Summer time, and very hot Weather, of Seamen loſt in the Night, which the Sailors took for granted were gone off upon ſuch like Occaſions unobſerv'd. And I remember this Perſon was actually going overboard, when one of his Brethren, who ſuſpected his Deſign, as he told me, caught hold of him juſt as he was going to leap off, call'd for Help, and ſecur'd him.

This Diſtemper, I am of opinion, is what we call a *Phrenitis*, occaſion'd by a more than ordinary Efferveſcence and Heat of the Blood, which diſtracting and confounding, if not inflaming the Animal Spirits, is the Cauſe of all thoſe irregular Motions, violent Exploſions and Convulſions. Hence 'tis the Animal Ideas are confus'd, the Imagination deprav'd, and all the rational Functions diſorder'd. From theſe Orgaſms in the Animal Spirits, we may, I fancy, give ſome Account of the want of Pulſe too, their conſtant and impetuous Motions thro' the Fibres, not admitting any diſtinct Arterial Vibrations. And perhaps Phlebotomy did not ſucceed at firſt, becauſe the Orifices contracting preſently, prevented its Effuſion, and probably the Thickneſs of the Blood concurr'd not a little in this Phænomenon. His calling out for the green Fields, the true Criterion of this Diſeaſe, I take to be from the violent Heat he was then in, which made him fancy green Fields and open Air to cool himſelf in at that time, the Ship being too warm for him under theſe Circumſtances for want of Air. And laſtly, Calentures happen oftner by Night than by Day, becauſe our Ships are more cloſely ſhut up by Night, and are leſs airy than they are in the Day-time.

A Remarkable *Caſe of the* Hydrophobia, *by Mr.* De la Prime, *n.* 277. *p.* 1074.

XVI.] In 1695, my Brother had a pretty Greyhound Bitch that had Whelps; ſoon after a mad Dog bit this Bitch unknown to the Family, upon which about 3 Weeks after ſhe ran mad, and they were forced to kill her; but ſaving her Whelps, becauſe that no Sign of Madneſs appear'd in them, in about 3 Weeks more they all pull'd out one another's Throats except one, which eſcaping, my Brother's Men valued and nouriſh'd, made much of it, and ſtroak'd it. At length, perceiving that it could not lap, nor ſwallow any liquid thing, they put their Fingers in its Mouth, and felt its Tongue and Throat; but finding nothing wrong therein as far as they could diſcover, they let it alone a Day or two longer, and then it ran mad and died.

They being thus dead, were ſoon forgot, until that about 3 Weeks after, my Brother's Servant, a moſt ſtrong laborious Man, that had frequently put his Fingers into the Whelp's Mouth, began to be troubled now and then with an exceeding acute Pain in the Head, ſometimes once, ſometimes twice a Day, ſo very vehement that he was forc'd to hold his Head with both his Hands, to hinder it from riving in two, which Fits commonly held him about an Hour at a time; in which his Throat would contract, as he ſaid, and his Pulſe tremble, and his Eyes behold every thing of a fiery red Colour. Thus was he tormented for a whole Week together, but being of a ſtrong Conſtitution, and returning to his Labour in every Interval, he ſweat and wrought it off, without any Phyſic.

But it went worſe with one of his Fellow-Servants, a young Apprentice of about 14 Years of Age, who had made as much of the Whelp as he, but was not of ſo ſtrong a Conſtitution; he was ſeiz'd alſo with a Pain in his Head, was ſomewhat Feveriſh, ſometimes better, ſometimes worſe, cough'd much, had a good Stomach, eat heartily, but could drink nothing. I know not what I ail, ſays he, I cannot ſwallow any Beer, *&c.* and ſo laugh'd at it. When he went out of doors, tho' there was but a little North Wind, yet he always ran as if it had been for his Life; when they aſk'd him why he did ſo, he told them he could not tell, but that the Wind would needs ſtop his Breath. A Day or two after this he was worſe, and vomited a ſtrange naſty ſort of Matter, like black Blood, which ſtunk like Sallet Oil, but much ſtronger; which he did ſeveral times: after which he would be pretty well, and walk about, but moſt commonly ran as faſt as ever he could, firſt out of one Corner, then into another, then up ſtairs, then down again, as if it was for his Life. But upon the third Day of his Confinement within doors, he grew perfectly mad, would ſtart, and leap, and twiſt his Hands and Arms together, point at People, and laugh and talk any thing that came into his Mind. In ſome of his Fits he was ſo ſtrong, that he was too hard for four young Men to hold him down in the Chair where he ſat; but as ſoon as they were over, he was lightſome, and laugh'd, and talk'd, but all his Diſcourſe was of fighting, and how if that they would but let him alone, he would leap upon them, and bite, and tear them to Pieces: And when one ſaid unto him, that he was ſure that he would not hurt him, he'd been always his Friend; he anſwer'd ſharply, that Friends and Foes were all alike to him, he'd tear them all in Pieces, *&c.* About an Hour after his Fit came again, which ſoon made him ſpeechleſs, ſeiz'd wholly upon his Brain, and then he died juſt before the Phyſician came.

An Account of Three Caſes *of the* Hydrophobia, *by Dr.* R. Mead. *n.* 323. *p.* 433.

2.] The Symptoms from the Bite of a Mad Dog are ſo ſurprizing and terrible, that it is hardly poſſible to deſcribe the Agony of a Patient in this unhappy Condition. I have lately had the Opportunity to ſee two Inſtances of this Caſe.

The firſt was of a Lad of about the Age of Nine Years, a ſturdy and bold Boy. A mad Bitch of the Mungrel kind was hunted in the Street, he ſtruck at her with a Stick, and ſhe flying in his Face, bit him in the right Cheek, which was torn with a large Wound to the middle of the Noſe. This was on the 20th of *April* laſt. A Surgeon cured the Wound in about 14 Days time, by applying for the firſt three Days, *Theriac. Andromach.* in *Sp. Vin.* and afterwards dreſſing it with *Liniment. Arcæi* and *Balſam. Terebinthin.* No other Care was taken, only a *Bolus* of *Theriac. Andromach.* was given him every Night while under Cure, and quickly after he was bit, he was perſuaded to eat the whole Liver of the Bitch fry'd.

He continued very briſk and well to the 22d of *May*; upon that Day he ſeem'd dull and ſick, would eat no Dinner, except a little boil'd Spinnage, walk'd out in the Afternoon, and in the Evening complain'd of his Stomach and Head; his Mother gave him a ſmall Glaſs of Brandy, for he would drink nothing elſe. In the Night he was very bad, ſtartled often, and ſcream'd out as in an Agony, eſpecially when deſired to drink; and complain'd miſerably whenever he made Urine, ſaying it hurt him. The next Morning he vomited up the Herbs he had eat the Day before, unalter'd. I was ſent for that Day in the Afternoon, and found him in a perfect Agony, all in a ſweat, trembling, toſſing himſelf up and down, talking continually, looking very wild; his Pulſe low, and ſometimes quicker, then ſlower: His Urine made the Night before as well colour'd as ordinary. I deſired him to drink; he took a little in his Mouth, but as it was going down, he threw it out with Violence, ſaying it hurt him; and praying that he might take no more. We over perſuaded him to hold a little in his Mouth and ſwallow it by degrees and gently; he did ſo with a little more eaſe, but was glad when 'twas over. We bid him ſuck the Drink thro' a Quill; he try'd; but could not get it down by continual Gulps, but ſtopp'd as ſoon as a very little was paſs'd, ſtill crying out that it hurt him to ſwallow it.

I preſently declared the Caſe to be deſperate. However for the Satisfaction of the Relations, Bliſtering Plaiſters were apply'd to the Back, and on each Side of the Neck; and a Diuretic *Bolus* of *Sal Succin. Campbor.* and *Conſerv. Lujul.* was given every ſix Hours; for he ſeemed from the firſt of his Complaint to have a difficulty of Urine.

The next Day, the 24th at Noon, I found him much worſe, he had raved all Night; could not bear the Sight of any thing white, and ſaid, that if all the Women in the Room who had white Aprons would go out, he ſhould be well preſently. He ſaid he would drink if we would give it him in a black Cup; but when brought, made many Excuſes and could not, tho' at the ſame time he complain'd he was dry, and pleaſed himſelf with talking of full Pots. He eat ſome Bread and Butter heartily, but vomited it up quickly, together with a frothy Slime. We dipped him in a Tub of warm Water; he ſaid he was not afraid of Water, and was quiet in it for a little while, but ſoon fell into a Convulſion Fit, which obliged us to take him out. I obſerv'd his Eyes to grow more ſtaring, and the Pupil to be prodigiouſly enlarged. He was thrown continually with ſuch Violence from Place to Place, that it was very hard to keep him in Bed; and quite tired and ſpent, fell into cold Sweats, and died this Day at Four in the Afternoon.

The next Day I obtain'd leave to open the Body. We examin'd the Brain, Throat, Breaſt and Stomach, but met with no extraordinary Appearance any where, excepting that there was a great Quantity of greeniſh viſcid Bile in the Stomach.

The other Patient was a very luſty vigorous Man of 45 Years. He had ten Weeks before been bit in one of the Fore-fingers near the Nail, by a little Naked Dog of the *Guinea* Breed. On the 8th of *November*, in the Morning, he complain'd of a great Sickneſs at his Stomach, and vomited green and yellow Choler. The next Morning he took a Doſe of *Rad. Ipecacuanh.* Whilſt he was vomiting, he complain'd of a Difficulty of ſwallowing; and when preſs'd to drink to work off the Medicine, contriv'd himſelf a way of ſucking the Gruel given him thro' a Piece of a Tobacco pipe, but could not get down above one Pint; and tho' he afterwards often try'd this Trick, yet it did not ſucceed.

On the 10th he had eight Ounces of Blood taken away at the Arm, and took a *Bolus* of *Theriac. Andromach.* with *Lap. Contrayerv.*

I came to him on the 11th; found him ty'd in his Bed, raving Mad, biting and ſpitting at the By-ſtanders, crying out Murder, making an odd Noiſe as if he cough'd up ſomething from the Throat: this Motion I had alſo took notice of in the Boy, and I ſuppoſe this is what ſome Authors have call'd *Barking*.

He ſaid he would drink if we would unbind him, and give him Water; but as ſoon as it came to his Mouth, he threw away the Cup with the greateſt Fury imaginable, and grew ſo unruly, that he was with much ado ty'd down again.

I obſerved that he had a Palſy of his right Arm, for he mov'd this only by the help of the other; and thoſe who attended him, had taken notice that this Symptom began the Day before, and that at the ſame time he had endeavour'd to read, but could not, complaining of a Miſt before his Eyes.

As he ſeem'd afraid of every body, ſo he ſhewed the greateſt Enmity to thoſe, for whom at other times he uſed to have the moſt Love and Reſpect.

I ordered a Surgeon to take away 20 Ounces of Blood at his Arm: And obſerv'd it to be very thick and black. He was very tame after this for a few Minutes, but fell again into his outragious Fit, in which he ſoon laid himſelf down quite ſpent, and died.

I could not get leave to open the Body.

Of the Bite of a Mad Fox.

Since theſe Accidents, I have had an Account ſent me by a Surgeon from *Stamford* in *Lincolnſhire*, of a young Man of about 18 Years, who died *Hydrophobous* by the Bite of a mad *Fox*, that had been bit by a mad Dog. The Symptoms diſcovered themſelves three Months after the Wound, which was upon the back of the Hand, and being healed by the Application of *Theriaca Andromach.* had left a ſmall black Scab behind.

Three Days before his Death he was ſeized with a Fever, for which he was blooded, vomited and bliſtered; he bit to Pieces the Glaſs in which Drink was given him. When diſſected, the *Fauces* were found very much inflamed; the left Lobe of the Lungs black, with the Veſicles full of black Blood; the Surface in ſome Places, which the Blackneſs had not cover'd, appearing bliſtered, as if raiſed by *Cantharides*. The Liver was hard, and of a yellow bilious Colour.

During the whole Violence of the Diſtemper, the *Penis* was obſerved o be continually erected, and as hard as a Bone. This Symptom is articularly taken notice of by *Cælius Aurelianus*.

The Surgeon who opened the Body, with his Knife ſlightly wound- his Fore-finger, and was ſurpriz'd to find that it feſtered, and gave m much more Pain than a greater Cut had at other times done. his I the rather take notice of, becauſe ſomething of the ſame nature appen'd to the Surgeon who diſſected my Patient. His Hand the ollowing Night was taken with an *Eryſipelas*, attended with great

Tenſion and Pain: This was owing to a little Wound made in one of his Fingers a Day or two before, from which, in turning over the Parts, he had rubb'd off the Plaiſter; and it went not off without the continued Application of cooling and diſcutient Medicines.

From all theſe Hiſtories, it may not perhaps be wrong to conclude, that the * *Hydrophobia*, (a Name not very proper for the Diſtemper) is the Effect of a particular kind of an Inflammation in the Blood, accompany'd with ſo great a Tenſion and Drineſs of the Nervous Membranes, and ſuch an Elaſticity and Force of the Fluid with which they are filled, that the moſt common Repreſentations are made to the Mind with too great Effect, and the uſual Impreſſions of Objects upon the Organs cannot be ſuffered: Hence proceed the Timorouſneſs, unaccountable Anxiety and Inquietude, which are always the Forerunners of the Dread of Liquids; as alſo did the Pain in making Water, and the ſtrange Averſion obſerved in the Boy at the ſight of any thing *White*; the *Retina* being really hurt and grieved by the ſtriking of the Rays of Light upon it. Nor is it hard to conceive that when the *Salival* Liquor is hot, and the Throat inflam'd and dry, the ſwallowing of Drink ſhould cauſe an intolerable Agony; no more than it is that, when things are wrought up to this wretched Condition, the diſmal Tragedy ſhould not laſt above three or four Days at moſt, in which the Patient is perfectly fatigued and torn to Death by the Violence of his Actions and Efforts.

The Hiſtory of the Inoculation *of the* Small-Pox. *Extracted from a Letter of Dr.* E. Timoni, *n.* 339. *p.* 72.

XVII. 1.] The Writer of this Diſcourſe obſerves, that the *Circaſſians*, *Georgians*, and other *Aſiaticks*, have introduc'd this Practice of procuring the *Small-Pox*, by a ſort of Inoculation, for about the Space of forty Years, among the *Turks* and others at *Conſtantinople*.

That altho' at firſt the more prudent were very cautious in the Uſe of this Practice; yet the happy Succeſs it has been found to have in thouſands of Subjects for theſe eight Years paſt, has now put it out of all ſuſpicion and doubt; ſince the Operation having been perform'd on Perſons of all Ages, Sexes, and different Temperaments, and even in the worſt Conſtitution of the Air, yet none have been found to die of the *Small-Pox*; when at the ſame time it was very mortal when it ſeized the Patient the common way, of which half the affected dy'd. This he atteſts upon his own Obſervation.

Next he obſerves, they that have this Inoculation, practiſed upon them, are ſubject to very ſlight ſymptoms, ſome being ſcarce ſenb they are ill or ſick; and that it never leaves any Scars or Pits in t Face.

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* Vide *Eſſays on Poiſons.*

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The Method of the Operation is thus. Choice being made of a proper Contagion, the Matter of the Puſtules is to be communicated to the Perſon propoſed to take the Infection; whence it has, metaphorically, the Name of Inciſion or Inoculation. For this purpoſe they make choice of ſome Boy, or young Lad, of a ſound healthy Temperament, that is ſeized with the common *Small-Pox*, (of the diſtinct, not Flux ſort). On the twelfth or thirteenth Day from the Beginning of his Sickneſs, they with a Needle prick the Tubercles (chiefly thoſe on the Shins and Hams) and preſs out the Matter coming from them into ſome convenient Veſſel of Glaſs, or the like, to receive it; it is convenient to waſh and clean the Veſſel firſt with warm Water: A convenient quantity of this Matter being thus collected, is to be ſtopp'd cloſe, and kept warm in the Boſom of the Perſon that carries it, and, as ſoon as may be, brought to the Place of the expecting future Patient.

The Patient therefore being in a warm Chamber, the Operator is to make ſeveral little Wounds with a Needle, in one, two or more Places of the Skin, 'till ſome Drops of Blood follow, and immediately drop out ſome Drops of the Matter in the Glaſs, and mix it well with the Blood iſſuing out; one Drop of the Matter is ſufficient for each Place prick'd. Theſe Punctures are made indifferently in any of the fleſhy Parts, but ſucceed beſt in the Muſcles of the Arm or *Radius*. The Needle is to be a three-edg'd Surgeon's Needle; it may likewiſe be perform'd with a Lancet: The Cuſtom is to run the Needle tranſverſe, and rip up the Skin a little, that there may be a convenient dividing of the Part, and the mixing of the Matter with the Blood more eaſily perform'd; which is done, either with a blunt Stile, or an Ear-picker. The Wound is cover'd with half a Walnut-ſhell, or the like Concave Veſſel, and bound over, that the Matter be not rubb'd off by the Garments, which is all removed in a few Hours. The Patient is to take care of his Diet. In this Place the Cuſtom is to abſtain wholly from Fleſh aud Broth for 20 or 25 Days.

This Operation is perform'd, either in the Beginning of the Winter or in the Spring.

Some, for Caution, order the Matter to be brought from the Sick by a third Perſon, leſt any Infection ſhould be convey'd by the Cloaths of the Operator; but this is not material.

As to the Proceſs of this Matter, in reſpect of the *Idioſyncraſie*; the *Small-Pox* begins to appear ſooner in ſome than in others, in ſome with ater, in others with leſſer Symptoms; but with happy Succeſs in all. this Place the Effloreſcence commonly begins at the End of the ſe- nth Day, which ſeems to favour the Doctrine of *Criſes*.

It was obſerv'd, in a Year when the common *Small-Pox* was very ortal, that thoſe by Inciſion were alſo attended with greater Symp- ms. Of 50 Perſons, who had the Inciſion made upon them almoſt the ſame Day, four were found in whom the Eruption was too ſudden, the Tubercles more, and Symptoms worſe. There was ſome Suſpicion that theſe four had caught the common *Small-Pox* before the Inciſion was made; but there was not one but recovered after the Inciſion: In thoſe four the *Small-Pox* came near the confluent ſort. At other times the inoculated are diſtinct, few and ſcatter'd; commonly 10 or 20 break out; here and there one has but 2 or 3, few have 100. There are ſome in whom no Puſtule riſes, but the Places where the Inciſion was made, ſwell up into purulent Tubercles; yet theſe have never had the *Small-Pox* afterwards in their whole Lives; tho' they have cohabited with Perſons having it.

It is obſervable that a no ſmall Quantity of Matter runs for ſeveral Days, from the Place of the Inciſion.

The Pocks ariſing from this Operation are dry'd up in a ſhort time, and fall off, partly in thin Skins, and partly contrary to the common Sort, vaniſh by an inſenſible Waſting.

The Matter is hardly a thick *Pus*, as in the common, but a thinner kind of *Sanies*; whence they rarely pit, except at the Place of the Inciſion, where the Cicatrices left are not to be worn out by time, and whoſe Matter comes near the nature of *Pus*.

If an Apoſteme break out in any (which Infants are moſt ſubject to) yet there is nothing to be fear'd, for it is ſafely heal'd by Suppuration. If any other Symptom happens, 'tis eaſily cur'd by the common Remedies.

They ſcarce ever make uſe of the Matter of the Inſitious Pox, for a new Inciſion. If this Inoculation be made on Perſons who have before had the *Small-Pox*, they find no Alteration, and the Places prick'd preſently dry up; except in an ill Habit of Body, where poſſibly a ſlight Inflammation and Exulceration may happen for a few Days.

To this time I have known but one Boy, on whom the Operation was perform'd, and yet he had not the *Small-Pox*, but without any Miſchief; and ſome Months after catching the common Sort, he did very well. It is to be obſerv'd, that the Places of the Inciſion did not ſwell. I ſuſpect the Child prevented the Inſertion of the Matter, for he ſtruggled very much under the Operation.

The Matter to be inſerted will keep in the Glaſs very well for 12 Hours.

It is now eight Years ſince I have been an Eye-Witneſs of theſe Operations, and I have never obſerv'd any miſchievous Accidents from this Inciſion hitherto; and altho' ſuch Reports have been ſometimes ſpread among the Vulgar, yet having gone on purpoſe to the Houſes whence ſuch Rumours have ariſen, I have found the whole to be abſolutely falſe.

There was, in a certain Family, a Boy of 3 Years old, afflicted with the *Falling-Sickneſs*, the *King's-Evil*, an *Hereditary-Pox*, and a long *Maraſmus*. The Parents were deſirous to have the Inciſion made upon him; the *Small-Pox* were thrown off with eaſe; about the 40th Day he died of his *Maraſme*. In another Family, a Girl of three Years old was troubled with the like Fits, ſtrumous, attended with an *Hereditary Lues*, and labouring under a colliquative Looſeneſs for three Months. The Operation was perform'd on this Child; ſhe came off very well of the *Small-Pox*, which was all over the 15th Day; on the 32d ſhe died of her Looſeneſs, which had never left her the whole time.

I never maintain'd the Inoculation as a *Panacæa*, or Cure for all Diſeaſes; nor do I think it proper to be attempted on Perſons like to die.

The reſt of Dr. *Timoni*'s Letter contains his Reaſons for this Method of Practice; which being the *Ætiological* Part, is tranſlated from his own Words, as follows.

" That the Infection of the Small-Pox may be propagated by the *Infuſion* of *Pus*, no body will be ſurpriſed at, who has conſider'd the Doctrine of *Fermentation*. Nor is the Manner of Inoculation more obſcure than *Baking* or *Brewing*, in which the Bodies to be fermented ſwell when mixed with the Ferment, owing to that inteſtine Motion which is thereby communicated to them. If any one ſhould aſk me how it comes to paſs, that the ſame Small-Pox which are otherwiſe dangerous, and frequently mortal, by Inoculation are render'd void of all Danger; I anſwer, that the commoh Small-Pox are either occaſioned by ſome particular bad Diſpoſition of the Air, or propagated by Infection, from the Effluvia of the Perſon labouring in that Diſeaſe. The firſt Caſe happens but to few Individuals, and then only when a remarkable bad Habit of Body concurs, or at leaſt the pocky Seeds lying concealed in the Habit are very much exalted: But the ſecond is the moſt common of the two. In the firſt Caſe the malignant aerial Particles, in the ſecond the virulent infectious Corpuſcles, probably of a ſaline-ſulphureous Nature, but endued with a ſpecifick Putrefaction or Rancidity, as ſoon as they are received into the Body by Reſpiration, communicate a violent Contagion to the Spirits, whence the Maſs of Blood and Lymph are conſequently infected. That the *Spirits* are firſt ſeized with the Infection is agreeable to Reaſon, both becauſe the contagious Particles have immediate Entrance into the Fountains of the Spirits, *viz.* the Heart and Brain, and upon account of the Analogy there is betwixt theſe Effluvia and the Spirits themſelves, being both of a ſpirituous, aerial Texture. The ſudden and violent *Infection* of the *Spirits* may likewiſe be deduced, from ſo numerous and ſuch bad Symptoms of the nervous Syſtem, which for the moſt part accompany a bad kind of Small-Pox; and eſpecially from thoſe *Epileptick* Convulſions which happen to Infants, the very moment they are ſeized with the variolous Contagion, a long while before they are taken with the Fever. That the Maſs of *Blood* again is infected, appears not only from the Fever, but from the breaking out of the purulent Puſtules. And that the *Lymph* is likewiſe vitiated, is plain from the Swelling of the Glands in the Throat, from the Spitting, and frequently a plentiful Salivation. Amongſt theſe Symptoms the Circulation muſt neceſſarily be diſturb'd; but eſpecially the Particles of the Blood, from the undue Influence of the animal Spirits, muſt be very much diſturbed. But in the common Small-Pox I have obſerved Death to happen chiefly in two Ways.

The firſt is when few of the Small-Pox appearing, and proceeding ſlowly to a Suppuration, other untoward Symptoms come on; the ſecond is when too great a Crop of Puſtules brings on a cadaverous Putrefaction. In the firſt Caſe the Small-Pox are commonly called *Malignant:* But the Cauſe is either too great a Thinneſs and Solution of the Maſs of Blood, or too great a Coagulation of it and Inclination to Grumouſneſs. For if the exploſive Impetus of the Spirits is too much increaſed, the Particles of the Maſs of Blood will be too much rubbed againſt one another, and thereby be too attenuated, and render'd too ſubtile. The Blood in this State will elude Nature's Force, and as it will depoſit none of its feculent Parts in the ſecretory *Glands* and Strainers, it will not allow theſe Filtrations and Secretions to go on, which are requiſite for the Well-being of the animal Oeconomy. For the Figure of the Particles of the Blood muſt be diſproportion'd to the Configuration of the Pores in the ſmall Tubes and ſecretory Veſſels, upon account of their too great Subtilty; becauſe they would be purified by Filtration, if they kept their natural Figure and Bulk. And hence a *Concoction* is ſaid to be brought about by Incraſſation. Beſides this, the Celerity of the Blood being increaſed, hinders it from leaving its Fæces in the ſecretory Veſſels. Thus a Torrent running with great Force and Rapidity, hinders the rapid Waters from dropping their Sediment; becauſe the *centripetal* Force of the Earth that is mixed with the Water, is overcome by the ſtronger Force of the watery Globules ſtill driving it forwards, and jumbling it with themſelves. For a Force, for Example, that is equal to one, cannot deſcribe a perpendicular Line, when a Force equal to two is puſhing it horizontally. In the ſame manner, if the Wind blows very hard, the Rain ſeldom falls. In the ſame geometrical Proportion, (ſpeaking at leaſt probably) the Particles of the Blood, having their Motion increaſed by the ungoverned Spirits, are driven quickly through the ſecretory Tubes without leaving any Fæces behind them. Theſe Conjectures are probable from the Celerity of the *Pulſe*, the intenſe Fever, and Crudity of the Urine, without any Sweat. On the contrary, it ſometimes happens, that by the ſharp and cutting Particles of the poiſonous Ferment, the Spring of the animal Spirits is broken, corroded, or at leaſt relaxed; and thus the Motion of the Spirits becoming languid, the Particles of the Blood and Lymph are render'd torpid and ſlow. While therefore they are retarded in the Labyrinths of the Tubes, ſome of them are complicated confuſedly together, others of them piled as it were upon one another; and from the different Contact of their Surfaces with one another, they muſt neceſſarily deviate from their natural Configuration, and their Angles acquire new Dimenſions. Thus by a different Diſproportion from that above explained, between the Figures of the Particles and the Cavities of the Tubes, but attended with a no leſs diſaſterous Event, Nature is again diſturbed in her niceſt Operations. Theſe again are probable from the ſlow creeping Pulſe, and want of Fever, ſometimes obſerved in the moſt malignant Small-Pox, the Puſtules appearing ſlowly, and few in Number. Further, from the irregular and tumultuous Motion of the Spirits, there muſt ariſe at the ſame time an unequal Impulſe of the Blood in different Parts, and of the Veins and Arteries. For whether there are little *Fibrils* (as ſome will have it) found in the Blood, or there are Particles of the *Chyle* deſigned for particular Uſes, not yet well aſſimilated, very probably their Motion will be diſturb'd. For it is neceſſary that they ſhould move naturally according to their Length; but by the *unequal* Preſſure they loſe their rectilineal Figure, and are contorted into Wreaths and Semicircles. After they are thus contorted, and convolved with one another, being ſtill urged by the Circulation, they are formed into *Grumes*, or little Lumps. But if after all, theſe Fibrillæ are not allowed, certainly of whatever Figure the Particles of the Blood are, by this Inequality of Motion they muſt neceſſarily be drove out of their natural Situation. Theſe Particles then thus entangled with one another, deprived of their Vehicle the Serum, which is ſqueezed from them, become heavier as they form larger Concretions, and therefore overcome the impelling Force of the Blood. They muſt ſtop here and there, and *ſtagnate*, according as they happen firſt to cohere on this or that Place. Hence the livid *Spots*, and (which I have often obſerved in the Small-Pox attended with *Purples*) a *frequent making* of very limpid *Water* in great Quantity. This is the Hiſtory of the Diſſolution and Coagulation of the Blood. Hence it is no wonder that ſome die in the Small-Pox with Purples, Convulſions, Faintings, Watchings, Hæmorrhages, Delirium, violent Vomitings, Dyſenteries, *&c.* although they have but a moderate Crop of Puſtules. For the variolous Ferment very frequently is the Cauſe of the Small-Pox becoming mortal; ſo that although it may not be apt to produce a great deal of thick Pus, yet it may communicate the bad Effects above-mention'd to the Spirits, Fluids and Solids, either in the Manner already explained, or ſomewhat akin to it, and ſo occaſion Death; and this for the moſt part before the eleventh Day of the Diſeaſe. Let us come now to the ſecond Manner of the Small-Pox proving mortal. For ſometimes they have the ſame fatal Fermentation, though the Symptoms are very different, from the Body's being over- elmed, as it were, with cadaverous Pus. But it is probable that Pus generated from a Mixture of acid-ſaline Particles with the ſulphureous d oily Particles of the Maſs of Blood become thin and rancid. This njecture is ſupported by innumerable chemical Experiments, which inly demonſtrate, that by pouring any Acid to a Solution of any of fat Sulphurs made by Alkalies, there is immediately produced a Maſs a whitiſh Colour. The *variolous Ferment* then being ſucked in in eſpiration, by means of its proper acrid and perhaps putrefactive Diſpoſition,

poſition, may produce ſuch Contractions between the acid-ſaline and oily-ſulphureous Particles of the Blood, that not only the *Seeds* of the Small-Pox, which are in every Individual (though in ſmall Quantity) from the Womb, are agitated, impregnated, and converted into a *purulent* Putrefaction, but likewiſe the whole Maſs of Blood contracts a certain Acrimony, and by a kind of corruptive Motion becomes putrid and cadaverous. Thus, a Fire being kindled as it were, it happens that the fermenting Particles rage more than is neceſſary, for throwing off the Seeds of the Diſeaſe by Deſpumation. The Motion therefore is not *Depuratory*, ſerving to ſeparate the heterogeneous Particles from the reſt, but deſtructive and corrupting by the Ferment's overcoming and vitiating the whole Maſs; the corrupt and rebellious Particles having gained the Victory, and obliged all the reſt to come over to their Side. This we may obſerve very evidently in different kinds of *Liquors*, in which a Fermentation being ſometimes raiſed, there ſucceds a corruptive Motion, which ſpoils them entirely. Hence we ſee ſome, though they are free from the above-mention'd Symptoms, are ſuffocated in an immenſe Ocean of Pus, ſo to ſpeak; and the Danger from this is protracted 'till the two and twentieth Day of the Diſeaſe. In the laſt place we are to conſider, that the Solids and nobler Viſcera in theſe Caſes are very much affected, and ſtrangely *convulſed*; and by their various Diſtortions the Cavities of their Tubes, as well as their whole Functions, muſt neceſſarily be depraved. Thus then the containing, and contained Parts, and thoſe which give the Impulſe to both, by means of which three the whole animal Machine is regulated, are for the moſt part involved in one and the ſame Fate; and will any body be ſurpriſed, that a Group of mortal Symptoms ſhould ariſe therefrom? It may further be obſerved, that many who have got over the *Plague*, have been taken with the Small-Pox a Year afterwards, and had the ſame kind of *Buboes* which they had before in the Plague. Is not this a Sign of very great *Malignity?* Let us next examine the Method of *Inoculation*. And here every body muſt ſee, that in this Way of receiving the Infection the Caſe is quite different from what it is in the other. For in the firſt place it is plain that the *Spirits* are not infected; beſides, neither the *Lymph* nor *Blood* is impregnated with the Contagion, nor is there any Hurt communicated to the Solids. Hence the Symptoms are all gentle, none of the worſt Kind, and in Children no *Epileptick* Convulſions. For the Ferment of this Contagion is not ſpirituous, airy, and acute, but groſs, ſlow, and blunt. But the more ſubtle that Poiſons are, ſo much t
more dangerous. Being ſo much diſproportion'd then, there can be
Struggle between this Ferment and the animal Spirits. The variolo
Pus being immediately mixed with the Maſs of Blood is diluted in
as in a Sea, involved, abſorbed, and blunted in it; whereby it is r
der'd mild, and more tractable in its Nature. Theſe contagious P.
ticles having enter'd the Blood, preſently find out the native congeni
variolous Seeds there, and ferment together with them; but being com

bine

bined and entangled with one another, they are no longer capable of raiſing further Diſturbances, hunting after the Life, or ranſacking the Treaſures of the Spirits; for they deſtroy one another's Force, become harmleſs, groſſer, and more blunt than before. Sliding then immediately, upon the ſlippery, watery Particles, which ſerve as a Vehicle for them by the Motion of the Blood, from the Centre towards the Circumference, they are carried, as in a Stream, towards the Surface of the Body, and waſhed quite away. Do not we plainly ſee, that in the *Inoculated* Small-Pox there is not *Pus* generated, but a ſanious, that is, a more *diluted* and *watery Kind* of *Matter?* And does it not appear from this Phænomenon, that the acid-ſaline Particles of the contagious Ferment do not change the oily Particles ſcatter'd up and down the Blood into a cadaverous Virulence, but being rather diluted and ſaturated with more mild and light watery Particles, they are conveyed out of the Body? And from their leaving no Pits or Cicatrices behind them, is it not evident that the acrid, pointed, pungent, and corroſive Particles of the ſaline Ferment, are at once blunted by the balſamick Globules of the Blood, deprived of their Spiculæ, and being render'd more ſmooth, expelled out of the Body? While in the mean time the Texture of the Maſs of Blood is preſerved entire, and its Conſiſtence unalter'd. Here you ſee no Diſſolution of the Blood, no corrupting or deſtructive Motion of it. For in *Inoculation* the Blood only ferments ſo much as is ſufficient for ſeparating the impure from the pure, and throwing it off by Deſpumation. In this Motion of Fermentation the Spirits, Lymph, and ſolid Parts of the Body, are ſometimes affected only gently with a kind of Undulation; and if any of the contagious Particles happen to reach them, certainly (which is couched under the Metaphor of Inoculation) they muſt firſt be deprived of their mild native Acrimony, and become as it were tame, and ſmooth, or dulcified.

— *On the ſame; by Dr.* J. Pylarinus. n. 347. p. 393.

2.] This Medical Operation which I am going to explain, was not firſt diſcovered by the Improvers of Phyſick; but by a rude, uncultivated People. It is not known who was the firſt Inventor of it; but it is certain, that it was firſt in vogue in *Theſſaly* in *Greece*; and hence proceeding gradually through the neighbouring Countries and States, it at laſt arrived at the City of *Byzantium*, where it made very little Noiſe for ſome Years at firſt, and was ſeldom put in Practice, and only amongſt the lower People. But the Small-Pox becoming lately very epidemical, this Method began to come more into Practice; but ill was never adopted by People of Rank or Faſhion, 'till a certain *reek* Nobleman, of the ancient Race of the *Caryophilli*, in the Year 1701, towards the End of Winter, aſked me ſeriouſly what I thought f Inoculation, and whether I would adviſe him to try it upon four of is Children: for at that time they raged mortally all over the Country. told him I knew not what to ſay of an Affair I was ſo ignorant of, eing entirely unacquainted with this new Method; and at the ſame time deſired leave to talk to ſome Operator about it. Three Days afterwards when I went to him again, and the Diſcourſe was renewed about the ſame Subject, preſently there came a *Greek* Woman into the Room, who explained the whole *Operation* at large, and very diſtinctly, both as to the Manner of doing it, the Place, Time, and every other Circumſtance; though ſhe underſtood nothing of the true Cauſe, how the Small-Pox is produced by *Inoculation*. To all this ſhe added Experience, and innumerable Inſtances of its good Succeſs, ſome of which I had affirmed to me by People of great Veracity. Having conſidered well the Affair, I found it by no means repugnant to Reaſon and Nature; but eſpecially influenced by the Inſtances that were given, I told my Friend, who aſked my Advice again a few Days afterwards, that I thought it would be right to try the Experiment; though I could not help heſitating a little about it. Taking hold of this however, as having given my Aſſent, and being ſufficiently inſtructed in the proper Regimen during the whole Courſe of the Diſeaſe, he boldly ſet about the Inoculation, by means of the *Greek* Woman, of his four Children: the three youngeſt of which (between five and ſeven Years of Age) were very little ſick; and a few Puſtules appearing after a Week, the Fever went quite off, and they were free of all Danger. But the Eldeſt, who was about Eighteen, was much more ſeverely handled; for being taken with a continual and malignant Fever, attended with very bad Symptoms, and more Puſtules than the others, though not a great Load of them, he hardly got over the Diſeaſe after a Fortnight; which I attribute to his *Atrabilarian* Conſtitution, unwholſome Humours, and their neglecting to prepare his Body beforehand. The happy Succeſs of this Operation induced many of the Families of the Nobles to follow the Example. So that now without any manner of Heſitation, every one is willing to try Inoculation, except a few who are fearful. Only the *Turks*, who ſubmit themſelves entirely to the Decrees of *Fate*, and are leſs tractable, have hitherto neglected it.

This Operation is quite natural. The Small-Pox is produced by *Inoculation*, or *Tranſplanting*, metaphorically ſo called; which is nothing elſe than tranſlating the morbifick *Ferment* or *Pus*, taken from the Small-Pox, into a ſound Body, by a ſmall Wound made for the Purpoſe.

The phyſical Manner of producing it proceeds thus: The Pus being introduced into the Wound, puts on the Nature of a true Ferment; hence, by means of the Circulation being conveyed through proper Veſſels and Canals to the Maſs of Blood, it immediately infects thoſe Particles of it which have a variolous Tendency, and by communicating the Contagion, it excites, agitates, and impregnates the Seeds of Fermentation which lie concealed in them, and puts them in Motion; whence an univerſal Ebullition, or *Fermentation*, is produced; by the Force of which the impure and heterogeneous Particles being ſeparated, are critically propelled towards the Skin: Nature in the mean while checking the whole Proceſs by means of this Operation.

But to proceed to the Operation itſelf, and the Manner of performing it; I ſhall faithfully deſcribe the Method in which that Woman abovementioned ſafely operated, as alſo the Order, and all the other Circumſtances; from which a certain regular Method for the Operation may be deduced. And although I was not an Eye-witneſs to all I ſhall relate, I had a great many of the Circumſtances from the Mouth of the Inoculatrix, more from Perſons of very great Veracity; and the moſt and beſt of all I had occaſion to obſerve myſelf.

In the firſt place then a proper *Time* is to be pitched upon for Inoculation; which according to the Woman was the *Winter*, and ſhe never inoculated except in that Seaſon. But I ſhould likewiſe judge the Spring to be proper enough, upon account of the Air being then very temperate.

Secondly, ſhe is very nice in her Choice of the *Pus*; for ſhe will by no means take it promiſcuouſly from every Subject; but when the Diſeaſe is epidemical, ſhe takes the *Pus* from ripe Puſtules of ſome Girl of a good Habit, and a favourable kind of Pock, pricking it with a Pin and ſqueezing it gently out, and putting it into a little Shell or glaſs Veſſel very clean, and not too cold. This little Veſſel well covered over with Cloth, ſhe puts into the Boſom of her Servant to be kept warm, and as quickly as poſſible proceeds to the Operation. She rejects the *Pus* of thoſe who have been inoculated, as ineffectual; which however I ſhould take to be of a milder Nature, and at the ſame time of a ſufficient Strength. But this Affair ought to be determined by Experience.

Thirdly, ſhe adviſes that the *Air* of the *Room* where the Patient lies be kept as temperate as poſſible.

Fourthly, proceeding to the Operation, ſhe pricks the *middle* of the *Forehead*, and the *Temples* at the Root of the Hairs; as alſo the *Chin* and both the *Cheeks*, with a ſteel or golden Needle, not thruſting it in ſtraight, but obliquely, and ſeparating the Skin a little with the ſharp Point from the Fleſh below. Then with the ſame Needle ſhe introduces the *Pus* into the little Orifices, and ties a Bandage over the Parts. In the ſame manner ſhe pricks the Wriſts and Metatarſus, introduces the *Pus*, and ties a Bandage gently about them, adviſing the Patient by all means not to ſcratch the Parts or wet them. I ſhould rather chuſe to prick Parts that are more fleſhy, becauſe they are leſs liable to Inflammation and Pain, and free of the Tendons.

All the other Methods of *Inoculation* are rejected for this, as being abſurd, unuſual, unſucceſsful, and even dangerous.

In the mean time the Patient muſt lie moderately a-bed, and not too much.

Fifthly, ſhe enjoins a proper Regimen in the ſix Non-naturals, eſpecially in eating. For ſhe not only rigorouſly reſtricts them from *Wine* and *Meat*, but likewiſe from *Broth* 'till the *fortieth* Day: and ſeveral who have neglected this Injunction have ſuffered for it, by a new Crop of Puſtules breaking out about their Eyes, and other Symptoms not a little dangerous.

The *Inoculation* being thus properly performed, the Symptoms of the *Small-Pox* do not appear in all after the ſame Space of Time; for the *Ferment* acts variouſly in various Subjects, bringing on the Symptoms ſooner or later according to the Age, Conſtitution, and Strength of the Patient: although the Small-Pox themſelves almoſt always begin to appear the *ſeventh* Day, which is truly *critical.* Nor are there wanting Inſtances (though it but ſeldom happens) where the Puſtules have begun to break out the *firſt* Day.

The *Symptoms* vary according to the different Conſtitutions, Conditions of the Fluids, and particular Diſpoſition of Nature in the Patient; *viz.* more gentle, or violent according to theſe Circumſtances; but commonly they are not unlike thoſe of the natural Small-Pox, only for the moſt part more mild: and a great many feel hardly any Alteration or Hurt from them.

The *Eruption* is almoſt always of the *diſtinct* kind, and the *Puſtules* not numerous; but, frequently twenty or thirty, rarely a hundred, and very ſeldom two hundred.

I muſt obſerve in the *firſt* place, that ſome have been content with making only a little Wound in the Arm in inoculating, and have got off with a very few Puſtules, and been ſecured from the Diſeaſe for the future.

Secondly, it has ſometimes happened, that no Puſtules have appeared after the Inoculation, either becauſe there was no variolous Diſpoſition pre-exiſting in the Body, or from the infectious Quality of the Ferment being weakened: But afterwards the Diſeaſe happening to be epidemical, they who had been inoculated were taken with the Small-pox promiſcuouſly with the others.

Thirdly, the little Punctures or Wounds where the *Pus* is introduced always uſe to riſe into Puſtules; but in ſome they grow into purulent Tubercles, without any Puſtules appearing; and in others they degenerate into large Boils which throw out a great Quantity of *Pus.* Sometimes again theſe Parts, eſpecially the Hands and Feet, ſwell and are very painful, and after diſcharging a good deal of *Pus* they ſubſide, and then ſwell afreſh. In ſome People, though very rarely, there are *Abſceſſes* formed after ſome time near the Glands and Emunctories, which ſuppurate very gradually; thus Nature varies in different Habits of Body.

Laſtly, there have hardly ever any pernicious Effects been hitherto obſerved to ariſe from Inoculation, although it has been practiſed in every Age, Sex, and Conſtitution. And indeed if it is but properly gone about, and in Bodies fitly prepared for undergoing the Operation, it is abſolutely ſafe. For the Small-Pox produced in this Way are of a milder a milder Diſpoſition, than thoſe that go about epidemically; becauſe they are promoted by a Ferment or Contagion void of all Malignity. That Ebullition, by which the Maſs of Blood is agitated, and the whole Work perfected, performs its Office gently without Violence, being reſtricted within proper Bounds by Nature. Beſides, you can chuſe a proper Time and Seaſon for inoculating, and prepare the Body properly for receiving the Infection; which certainly ought to be of the greateſt Conſequence towards producing a happy Event of the Diſeaſe.

Remarks on the Plague *at* Copenhagen *in* 1711, *communicated by Mr.* J. Chamberlayne, *n.* 337. *p.* 279.

XVIII. This Diſeaſe began to ſhow itſelf firſt in *Copenhagen* about the Beginning of *July*, 1711. It increas'd 'till the Beginning of *September*; after which it diminiſhed by little and little to the End of the Year, at which time it totally ceaſed.

It appears, that before this Diſtemper there were about Sixty Thouſand Souls in *Copenhagen*: From whence they infer, that there is Born every Year about Two Thouſand, and that there dies nearly the ſame Number; which being multiplied by Thirty makes Sixty Thouſand.

In the ſix Months which this Diſtemper continued, it is thought it carried off about 25000 Souls. It is true, the publick Liſts reckon but 22535; but it is agreed by all, that in the laſt Week of *Auguſt*, and the two firſt Weeks of *September*, each of which carried off above 2300 Souls, there died a great many, of which there was no Notice taken.

Almoſt the very ſame happened two Years before at *Dantzick*; where, before the Plague broke out, there died weekly from 45 to 50; but the Number of the Dead increaſed by degrees to the Beginning of *September*; ſo that in the firſt Week of that Month there died 2205 Souls, in the ſecond Week 2070, and in the third 2075. After which the Mortality decreaſed to the End of the Year.

It is obſervable, that there were ſome Houſes which eſcaped the Infection; but that there were few where it did not carry off more than one or two Perſons; and that there were many in which it did not leave a Soul alive.

And that generally ſpeaking, this Diſtemper was moſt fatal to the meaner ſort of People; there ſcarce dying any Perſon of Note; but, on the contrary, a great Number of the Poor. Which may be attributed to ſeveral Cauſes.

The firſt, and moſt general of which, is their naſty manner of living. The ſecond is, that this ſort of People live very cloſe together, and as it were heaped one upon another; ſo that ſometimes there are four Families in one Room. The third is, the fooliſh Curioſity they have of ſeeing the dead Bodies. And fourthly, a great many of them are ſo bigotted to the *Turkiſh* Notion of Predeſtination, that they ſay, if it pleaſes God that I ſhould die of this Diſeaſe, I ſhall not eſcape it; and if it be his Pleaſure that I ſhall live, I can't die: And upon this Notion they go abroad every where, and ſo catch the Infection. There are ſome of 'em alſo, which make no ſcruple of lying in the ſame Beds where others have died.

The three Sorts of Trades, of which there died moſt, were Coffinmakers (which took meaſure of the dead Bodies) Surgeons, and Shoemakers.

The Care that was taken, and the Medicines that were uſed, did great Service. I was told that *Theriaca* did little good; and they obſerv'd the ſame alſo at *Dantzick*.

Of the Antiquity of the Venereal Diſeaſe, *by Mr.* W. Beckett. *n.* 355. *p.* 839.

XIX. It has been the general Opinion that the Venereal Diſeaſe was not known, at leaſt in *Europe*, 'till about the Year 1494. Notwithſtanding which, I ſhall make it evident that it was frequent amongſt us ſome hundred of Years before that Date. In doing this, I ſhall not quote any ancient Authorities from *Hippocrates*, *Galen*, *Celſus*, *Avicen*, &c. or the *Holy Scriptures*; That has been ſufficiently done already by ſeveral who have wrote of the Antiquity of this Diſeaſe, and particularly by Dr. *Patin*: But if we look only into our own Antiquities, and the ancient *Engliſh* Writers in Phyſic and Chirurgery, we may be furniſhed with Inſtances of the Frequency of this Diſtemper among us, long before ever our modern Authors dreamt it had its Appearance in *Europe*.

As to the firſt Degree then of this Diſeaſe, I ſhall prove from authentick Evidences that *it* was anciently call'd the **Brenning** or **Burning**; and that this Word has been ſucceſſively continu'd for many hundreds of Years, to ſignify the ſame Diſeaſe we now call a *Clap*; and that it was not diſcontinu'd 'till that Appellation firſt began to have its Riſe. The moſt likely Method to accompliſh my Deſign will be firſt to examine thoſe Records that relate to the *Stews*, which were by Authority allowed to be kept on the *Bank-ſide* in *Southwark*, under the Juriſdiction of the Biſhop of *Winchester*, and which were ſuppreſſed the 37th of *Henry* VIII. For it's impoſſible but, if there were any ſuch Diſtemper in being at that Time, it muſt be pretty common among thoſe leud Women who had a Licenſe for entertaining their Paramours, notwithſtanding any Rules or Orders which might be eſtabliſh'd to prevent its Increaſe: But if we ſhall find that there were Orders eſtabliſh'd to prevent the ſpreading of ſuch a Diſeaſe, that Perſons might be ſecure from any contagious Malady after their Entertainment at thoſe Houſes (which were anciently eighteen in Number, but in the Reign of *Henry* VII. reduced to twelve) we may then ſecurely depend upon it, that it was the Frequency of the Diſeaſe that put thoſe, that had the Authority, under a neceſſity of making ſuch Rules and Orders. For the ſame Powers that granted a Liberty for keeping open ſuch leud Houſes, muſt find it their Intereſt to ſecure, as much as poſſible, all Perſons from receiving any Injury there; leſt the frequency of ſuch Misfortunes ſhould deter others from frequenting them, and ſo the original Deſign of their Inſtitution ceaſe, from the entire ſinking of the Revenues. Now I find, that, as early as the Year 1162, divers Conſtitutions relating to the Lordſhip of *Winchester*, (being alſo confirmed by the King) were to be kept for ever, according to the old Cuſtoms that had been time out of Mind. Among which theſe were ſome, *viz.* No *Stew-holder* to take more for a Woman's Chamber in the Week than 14 *d.* Not to keep open his Doors upon Holy-Days. No ſingle Woman to be kept againſt her Will, that would leave her Sin. No ſingle Woman to take Money to lie with any Man, except ſhe lie with him all Night 'till the Morning. No *Stew-holder* to keep any Woman that hath the perilous Infirmity of **Burning.** Theſe and many more Orders were to be ſtrictly obſerved, or the Offenders to be ſeverely puniſhed. Now we are aſſured there is no other Diſeaſe that can be communicated by carnal Converſation with Women, but that which is Venereal, by reaſon that only is contagious; and it's evident the **Burning** was certainly ſo: For, had it been nothing elſe but ſome ſimple Ulceration, Heat, or Inflammation, there would have been no Contagion; and that affecting only the Woman, could not be communicated by any Venereal Congreſs, and ſo not infer a Neceſſity of her being comprehended under the reſtraining Article. Theſe Orders likewiſe prove the Diſeaſe was much more ancient than the Date abovemention'd; becauſe they were only a Renewal of ſuch as had been before eſtabliſhed time out of mind.

But to confirm this farther, I find that in the Cuſtody of the Biſhop of *Winchester*, whoſe Palace was ſituated on the *Bank-ſide*, near the *Stews*, was a Book written upon Vellum, the Title of which runs thus; **Here beginne the Ordinances, Rules, and Cuſtumes, as well for the Salvation of Mannes Lif, as for to aſchewe many Myſchiefs and Inconvenients that dayley be lik there for to fall owte, to be rightfully kept, and due Execution of them to be don unto any Perſon within the ſame.** One of the Articles begins thus; *De his qui cuſtodiunt Mulieres habentes Nephandam infirmitatem.* It goes on, *Item*, **That no Stew-holder keep noo Woman wythin his Hous that hath any Syckneſſe of** BRENNING, **but that ſhe be putte out upon the peyne of make it a fyne unto the Lord of a hundred Shyllyngs.** This is taken from the Original Manuſcript which was preſerved in the Biſhop's Court, ſuppoſed to be written about the Year 1430. From theſe Orders we may obſerve the Frequency of the Diſtemper at that Time; which, with other Inconveniencies, was **dayley lik there for to fall oute**: And the Greatneſs of the Penalty, as the Value of the Money then was, that is laid on it, proves it was no trifling or inſignificant Thing.

But the bare Proof of there having been anciently ſuch a Diſeaſe as was called the **Burning**, may be thought to be inſufficient, unleſs we were perfectly aſſured what it was, and how it was in thoſe Times deſcribed: I ſhall therefore do it from an unqueſtionable Authority, which is that of *John Arden*, Eſquire; who was one of the Surgeons to our King *Richard* II. and likewiſe to King *Henry* IV. In a curious Manuſcript of his upon Vellum, he defines it to be a certain inward Heat and Excoriation of the *Urethra*; which Deſcription gives us a perfect Idea of what we now call a *Clap*: For frequent Diſſections of thoſe that laboured under that Diſeaſe, have made it evident, that their *Urethra* is excoriated by the Virulency of the Matter they receive from the infected Woman; and this Excoriation or Ulceration is not confined to the *Oſtiola* or Mouths of the *Glandulæ Mucoſæ*, as has been lately thought, but may equally alike attack any Part of the *Urethra* not beyond the Reach of the impelled malignant Matter. The Heat before deſcribed, which theſe Perſons are ſenſible of, as well now as formerly, is a Conſequent of the excoriated *Urethra*; for the Salts contained in the Urine muſt neceſſarily prick and irritate the nervous *Fibrillæ*, and excite a Heat in thoſe Parts of the *Urethra* which are diveſted of their natural Membrane: which Heat will always be obſerved to be more or leſs, as the Salts are diluted with a greater or leſs Quantity of Urine; a thing I have often obſerved in Perſons that have laboured under this Infirmity in hot Weather, when the perſpirable Matter being thrown off in great Quantities, the Salts bear a greater Proportion to the Quantity of Urine, and thereby make its Diſcharge at that time ſo much the more painful and troubleſome.

Thus we ſee this very early and plain Deſcription of this Diſeaſe among us, to be entirely conformable to the lateſt and moſt exact Anatomical Diſcoveries. Here is no Tone of the *Teſticles* depraved, according to *Trajanus Petronius*; no Exulceration of the *Paraſtatæ*, according to *Rondeletius*; no Ulceration of the *Seminal Veſſels*, according to *Platerus*; no Seat of the Diſeaſe in the *Veſiculæ Seminales* or *Proſtatæ*, according to *Bartholin*; nor in thoſe Parts and the Teſticles at the ſame time, according to *Wharton* and others, who have falſely fixed the Seat of this Diſeaſe, and whoſe Notions, in this reſpect, are now juſtly exploded; but a ſimple and true Deſcription of it, and its Situation about an hundred and fifty Years before any of thoſe Gentlemen obliged the World with their Labours.

Having ſufficiently made it appear, that the **Burning** was a Diſeaſe very early among us, and given the Deſcription of it, I ſhall ſay ſomething of the ancient Method that was made uſe of to cure it. We are not to expect the Meaſures our Predeceſſors, in thoſe early Times, made uſe of, ſhould be calculated for the removing any Malignity in the Maſs of Blood, or other Juices, according to the Practice in Venereal Caſes at this Time; becauſe they looked upon the Diſeaſe to be entirely local, and the whole of the Cure to depend upon the Removal of the Symptoms: Hence 'twas they recommended ſuch Remedies as were accommodated to the taking off the inward Heat of the Part, and cure the Excoriations or Ulcerations of the *Urethra*. The Proceſs for accompliſhing of this, I ſhall ſet down from the before-mentioned *John Arden*, who wrote about the Year 1380. His Words are as follow: *Contra Incendium. Item* *contra incendium Virgæ Virilis interius ex calore & excoriatione, fiat talis Syringa* (i. e. *injectio*) *lenitiva. Accipe Lac mulieris maſculum nutrientis, & parum zucarium, Oleum violæ & ptiſanæ, quibus commixtis per Syringam infundatur, & ſi prædictis admiſcueris lac Amigdalarum melior erit medicina.* There is no doubt but this Remedy, being uſed to our Patients at this Time, would infallibly take off the inward Heat of the Part, and cure the Excoriations or Ulcerations of the *Urethra*, by which means what iſſued from thence would be entirely ſtopp'd; and this was all they expected from their Medicines; foraſmuch as they were entirely unacquainted with the Nature of the Diſtemper; and did not in the leaſt imagine, but if the Symptoms that firſt attack'd the Part were removed, the Patient was entirely cured.

I ſhall now, as a farther Confirmation of what I have advanced, proceed to prove, that by this **Brenning or Burning** is meant the Venereal Diſeaſe; by demonſtrating that ſucceeding Hiſtorians, Phyſical and Chirurgical Writers, and others, have all along with us in *England* uſed the very ſame Word to ſignify the Venereal Malady. In an old Manuſcript I have by me, written about the Year 1390, is a Receipt for **Brenning of the Pyntyl, þat Men clepe þe Apegalle; Galle** being an old *Engliſh* Word for a running Sore. They who know the *Etymology* of the word *Apron*, cannot be ignorant of this. And in another Manuſcript, written about 50 Years after, is a Receipt for **Burning** in that Part by a Woman. *Simon Fiſh*, a zealous Promoter of the Reformation in the Reign of *Henry* VIII. in his Supplication of Beggars, preſented to the King in 1530, ſays as follows; *These be they* (ſpeaking of the *Romiſh Prieſts*) *that corrupt the whole Generation of Mankind in your Realm, that catch the Pockes of one Woman, and bear them to another; that be* **Burnt** *with one Woman, and bear it to another.* But to make this Matter ſtill more evident, I am to obſerve, that *Andrew Board*, a Doctor in Phyſick, and *Romiſh* Prieſt, in the Reign of *Henry* VIII. in a Book he wrote, entitled, *The Breviary of Health*, printed in 1546, ſpeaks very particularly of this ſort of Burning; one of his Chapters beginneth thus, **The 19th Chapiter doth ſhew of** BURNING **of an Harlotte**; where his Notion of communicating the *Burning* is very particular. The ſame Author adds, that if a Man be **Burnt** with an *Harlot*, and do meddle with another Woman within a Day, he ſhall **Burn** the Woman that he ſhall meddle withal; and as an immediate Remedy againſt the **Burning**, he recommends the waſhing the *Pudenda* two or three times with white Wine, or elſe with Sack and Water; but if the Matter have continued long, to go to an expert Chirurgeon to have Help. In his 82d Chapter, he ſpeaks of two ſorts of Burning, the one by Fire, and the other by a Woman through carnal Copulation, and refers the Perſon that is **Burnt** of a *Harlot* to another Chapter of his for Advice, what to do, **yf he get a Dorſer or two,** ſo called from its Protuberancy or bunching out: For I find about that Time the word

Bubo was moſtly made uſe of, to ſignify that ſort of Swelling which uſually happens in Peſtilential Diſeaſes.

From hence it appears, the *Burning*, by its Conſequents, was *Venereal*, ſince every Day's Experience makes it evident, that the ill Treatment of the firſt Symptoms of the Diſeaſe, either by aſtringent Medicines, or the removing them by cooling and healing the excoriated Parts, will generally be attended with ſuch Swellings in the Groin, which we rarely obſerve to happen from any other Cauſe whatſoever.

I ſhall give a few more Inſtances of this Diſeaſe call'd the *Burning*. In a Manuſcript I have of the Vocation of *John Bale* to the Biſhoprick of *Oſſory* in *Ireland*, written by himſelf, he ſpeaks of Dr. *Hugh Weſton* (who was Dean of *Windſor* in 1556, but deprived by Cardinal *Pole* for Adultery) as follows: "At this Day is lecherous *Weſton*, who is more "practiſed in the Art of **Brech-Burning** than all the *Whores* of the "*Stews.*" And again, ſpeaking of the ſame Perſon, he ſays, "He "not long ago **brent** a *Beggar* in St. *Botolph*'s Pariſh." The Author ſays of him elſewhere, "He had been ſore bitten with a *Wincheſter-Gooſe*, and "was not yet healed thereof:" Which was a common Phraſe for the Pox at that Time, becauſe the *Stews* were under the Juriſdiction of the B^p of *Wincheſter*. *Mich. Wood*, in his *Epiſtle* before *Step. Gardiner*'s *Oration de vera Obedientia*, printed at *Rhoan*, 1553, gives another Evidence of the **Burning**. And *William Bullein*, a Phyſician in the Reign of Queen *Elizabeth*, in a Book he publiſh'd, call'd *The Bulwark of Defence*, &c. printed in 1562, bringing in *Sickneſs* demanding of *Health* what he ſhould do with a Diſeaſe call'd the *French Pockes*, *Health* anſwers, "He would not "that any ſhould fiſh for this Diſeaſe, or to be bold when he is bitten "to thynke thereby to be helped, but rather to eſchewe the Cauſe of "thys Infyrmity, and filthy rotten **Burning** of *Harlots*."

From theſe Inſtances it ſufficiently appears, That the firſt Degree of the Venereal Diſeaſe was anciently known among us under the Title of **Burning**. And I can make it appear from my Collections, that the Diſeaſe, when it came to be confirm'd, was no Novelty here in thoſe early Times.

XX. *Account of Books omitted.*

n. 320. p. 324. 1. An Account of *Animal Secretion*, the *Quantity* of *Blood* in the *Human Body*, and of *Muſcular Motion*; by *James Keill*, M. D. 8vo.

n. 273. p. 918. 2. D. *Dominici Sanguineti* Appuli *Diſſertationes Iatrophyſicæ*. Neapoli, 1699.

n. 273. p. 914. 3. *Jac. Gaveti* Academ. *Monſpel.* Alumni *Avenionenſis* Doct. Med. & apud *Camberienſes* Practici, *Nova Febris Idæa*, ſeu Conjecturæ Phyſicæ circa *Febris* Naturam. *Genevæ* 1700. 8vo.

n. 283. p. 1312. 4. An Abſtract of Dr. *R. Mead*'s Mechanical *Account of Poiſons*; by Mr. *Sam. Morland*.

n. 337. p. 101. 5. An Abridgment of a Book, intitled, *A Deſcription of the Plague at* Dantzick *in* 1709. Written in *High-Dutch*; by Dr. *John Chriſtoph. Gottwald*. Tranſlated by Dr. *C. J. Sprengell*, M. D.

CHAP.

CHAP. VII.

The Bones, Joints, and Muſcles.

An Account of Horn-like Excreſcences on the Fingers; by Dr. R. Wroe. n. 297. p. 1899.

I. AT *Bolton* (eight Miles from *Mancheſter*) lives one *Nathanael Hulme*, about ſeventeen Years of Age, who had the Small-Pox when he was about eight Years old; ſoon after which he had a great Itch, almoſt to the degree of a Leproſy, with which his Finger-nails and Thumb-nails began to grow thick, and by degrees harden'd into Horns; which grew in ſeven or eight Months to the Length of an Inch, and ſome almoſt two Inches, and ſome much longer. It began in the Fore-finger of the Left-hand, and ſo proceeded to all the reſt of that Hand, which had as many Horns as Fingers and a Thumb. All which Horns about the End of twelve Months fell off by degrees; that which grew firſt falling off firſt, without any Pain, unleſs when cut off, as they were at firſt, there appearing great Quicks (as they call them) or Roots under the Nails. By degrees they came on the Thumb, and then on the Fingers of the Right-hand; which grew to the ſame Length in about a Year's time, and then fell off, he having ſhed them five or ſix ſeveral times. One of the Horns that grew on the Ring-finger of the Left-hand was a quarter long. They are at preſent all come off his Left-hand, but are growing again; that on his little Finger is two Inches long.

This Account I took of him above two Years ſince in 1702; and have ſeen him frequently ſince, and lately, and the Horns ſtill grow and fall off as uſual.

At preſent [*October* 1704.] all the Fingers of both Hands are arm'd with Horns, as are alſo all his Toes, which he keeps cut that he may be able to wear Shoes. I ſaw him a few Days ſince, and think he cannot live long, being miſerably overſpread with his Leproſy.

One of the *Horns* above-mention'd is in the *Repoſitory* of the *Society*.

Of Human Bones *of an* Extraordinary Size, *by Mr.* W. Cheſelden. *n.* 333. *p.* 436.

II. The Circumference of *Scull*, according to its Length, is 26 Inches, and according to its Breadth 23 Inches.

The greateſt Diameter of each *Os Innominatum* is 12 Inches.

The left *Os Femoris* is 24 Inches long, having only one (and that the great) *Trochanter*.

The right *Os Femoris* is 23 Inches long, having three *Trochanter* Proceſſes.

Each *Tibia* is 21 Inches long.

If all the Parts bore a due Proportion, this Man muſt have been eight Foot high.

Theſe Bones were found near an Urn, inſcrib'd *Marcus Antoninus*, in the place of the *Roman* Camp near St. *Alban*'s in *Hertfordſhire*.

Of a Callus *ſupplying the* Loſs *of part of the* Os Femoris; *by Mr.* B. Sherman. *n.* 323. *p.* 451.

III. 1.] A Compound Fracture happen'd on the Thigh of a young Man about ſeventeen: I was oblig'd to take out the whole Subſtance of the *Os Femoris* for about two Inches; and yet, by keeping a due Extenſion, Nature in four Months time ſupply'd ſuch a *Callus*, that the Part is not a quarter of an Inch ſhorter than the other Side; and the Perſon is as ſtrong as ever, and walks without any Lameneſs.

Of a Callus *ſupplying the* Loſs *of part of the* Os Humeri; *by Mr.* J. Fawler. *n.* 312. *p.* 2466.

2.] *John Marſh* of *Denton* in *Kent* (about 16 Years old) was troubled with a Tumour on his Arm in the End of a Continual Fever, which ſeem'd to be a Critical Diſcharge of the Humour of the Fever on his Arm: He was managed by a Surgeon of that Place for two Years for this Tumour, and there being no Appearance of a Cure, he was ſent to me. At firſt dreſſing, I found two *Sinuous Ulcers* in his right Arm, one upwards about the *Deltoid* Muſcle, and the other on the under part of his Arm, within an Inch and a half of the Juncture of the *Cubitus*; the *Sinus* above paſſing upwards within an Inch and a half of the Juncture, and downwards to the *Cubitus*. The *Sinus* of the lower Part paſs'd downwards to the *Cubitus*, and upwards about an Inch and a half. When both theſe *Sinus's* were laid open, the Bone ſoon ſhow'd itſelf carious and looſe, ſo that I eaſily took it out, (*Fig.* 179.) and it was about five Inches long.

Fig. 179.

Three Weeks after, there came off another Spelt of the Bone of the inner Side (*Fig.* 180.) about two Inches long, having the Channel of the Marrow. Theſe Ulcers with much Care and Diligence were cured very well in nine Months: And the Place of the Bone is ſo well ſupplied with a ſtrong *Callus*, that he is not only very ſtrong, but can lift 50 Pound Weight with that Arm.

Fig. 180.

An Obſervation on a Fracture *of the* Neck *of the* Thigh-bone; *by Dr.* J. Douglas. *n.* 349. *p.* 501.

IV. The Fracture of the *Os Femoris* near its *Neck*, is often miſtaken for a Luxation of the Head of the ſame Bone, the globular Head being ſtill retain'd cloſe in the *Acetabulum Coxendicis*.

An old Woman turn'd of fourſcore, fell from her Chair, and ſuffer'd a Fracture in the upper part of the Thigh-bone. The Fracture was not only oblique, near the Neck of the Bone; but each *Trochanter* (*i. e.* the two *Proceſſes* near its *Cervix*) were likewiſe broke ſhort off; and were drawn up almoſt as high as the Head of the Bone itſelf, by the ſtrong Contraction of the *Glutæi* and other Muſcles. The Woman liv'd three Weeks after it, and though it was never reduc'd, yet ſhe complain'd of very little or no Pain.

Amongſt all the *Writers* in Surgery and Anatomy, I know but three who were appriz'd of this Miſtake, Mr. *Ambroſe Parey*, Dr. *Ruyſch*, and Mr. *Cheſelden*: But if we conſider the Depth of the Articulation, the wonderful Strength of the Muſcles that ſurround it, the many ſtrong Ligaments that bind the Head within the Socket, the Smallneſs of the Neck of the Bone, its porous and ſpungy Subſtance, which makes it much weaker than the reſt, and laſt of all the diſadvantageous oblique Poſition of this Neck, which expoſes it the more to outward Accidents; it will plainly appear that a Fracture can much more eaſily happen, than a Diſlocation in that Part from an external Cauſe.

Of a large Tumour *on the* Thigh, *by Mr.* C. Amijand. *n.* 317. *p.* 172.

V. Mr. *Vandenheyde*, a Surgeon of *Oſtend*, procur'd me the Sight of the largeſt Tumour I ever yet ſaw. The Tumour is of a ſchirrous Nature, ſpringing from the Thigh-bone, ſomewhat tending to that of a Cancerous. It firſt took its Riſe about two Years ago, in a Child of ten Years old, juſt above the *Patella*, without any evident Cauſe; and hath, notwithſtanding all poſſible Care, expanded itſelf ſo, that it now occupies the whole Thigh to the very Groin, and has extended itſelf to above a *Dutch* Yard in Circumference. It increaſes very much daily, and muſt ſoon exhauſt the Patient's Strength. The Surgeon intends to open him after he is dead, and to ſend an Account to Dr. *Ruyſch*.

Of a ſtrange Gangrene *in the* Thigh, &c. *by Mr.* Calep. *n.* 313. *p.* 41.

VI. 1.] The Wife of *Thomas Steven* of *Maidenhead* in the County of *Berks* (aged about 62 Years) was ſeized with a Fever about the latter End of *November* 1697. Her Phyſician uſed various Remedies to remove her Fever, which in about fourteen Days terminated in a Tumour and Numbneſs in her left Foot, both which did by degrees creep up her Leg, and half way up her Thigh. A Fomentation was order'd by her Phyſician made of *Centaur. Abſinth. Hyperic. &c.* boil'd in a ſtrong *Lixivium*; and after fomenting, he order'd them to anoint her Foot and Leg with *Ol. Terebinth.* wherein *Galbanum* was diſſolved. This Method they had uſed daily for a Month before I ſaw her, which was on *Jan.* 3, 1678. I then found her in the following Condition; (*viz.*) Her Foot and Leg cold, inſenſible, wither'd, hard as if dry'd in a Chimney, and a dark tawney Colour. Her Knee was ſwell'd, and had ſeveral large black Spots upon it, which pitted when preſs'd with my Finger. There were ſeveral Diſcolourations in the Skin, half way up her Thigh. She complain'd of great Pains, eſpecially at Nights, in her Knee and Thigh, yet could not feel me when I touch'd thoſe Parts. Her Fever was now increaſed again, and ſhe was delirious ſometimes. She begg'd heartily of me for Help; but I could propoſe nothing but the taking off her Thigh, which ſhe would not conſent to. I was not ſorry for her not admitting of that Operation, becauſe I could not expect any Succeſs in the performing it, by reaſon of her Age, Weakneſs, *&c.* So I took leave of her, ſuppoſing I ſhould never ſee her more. I adviſed her Friends to continue the uſe of the Fomentation, which they did almoſt Night and Day. About a Month after, coming to *Maidenhead*, I was ſurpriz'd to find this Woman alive. There was now a Diſcharge of black fœtid Matter, at a ſmall Orifice about the middle of the Inſide of her Thigh, which Orifice I enlarged to make a better Diſcharge for the Matter. I likewiſe cut into a Tumour that appear'd upon her Knee, but found nothing in it but Wind. I then took my leave of her, (as before) adviſing to continue fomenting daily. About a Month or 5 Weeks afterwards, I came to *Maidenhead* again, and found her alive; and to my Admiration found, that Nature had made a perfect Separation of the mortify'd Fleſh from the ſound, quite round the Thigh, the Bone of the Thigh lying wholly bare above the breadth of 4 Fingers, and deprived of its *Perioſteum*. The Fleſh above was freſh and florid, and had good white Matter upon it: I perſuaded her to let me take off her Thigh, which I did about two Fingers breadth in the ſound Fleſh, (becauſe the Fleſh ran tapering down to the Bone), by which I made the Stump pretty even. The Bleeding was little, by reaſon that the Veins and Arteries (which were eaten aſunder by the mortifying Matter) Nature had cloſed again. I dreſs'd the Stump with *Pulv. Reſtring.* mix'd with *Album. Ovor.* ſpread upon Pledgets, and dipp'd in *Ol. Terebinth.* hot. The next Dreſſings I uſed Digeſtives, and perform'd the reſt of the Cure according to the Rules of Art. The Woman is alive to this Day. I would have preſerved this Leg to have diſſected it, but the Friends of the Woman deceived me.

—On the ſame, *by Mr.* W. Cowper. ibid. *p.* 43.

2.] About the Beginning of *October*, 1707, I happened to be at *Maidenhead*, where I ſaw the Woman whoſe Caſe is here related; ſhe appear'd to be very decrepid, and would have ſhewn me the Stump of her Thigh bare, but the Coldneſs of the Weather, ſhe ſaid, would make it uneaſy to her. I felt it thro' her Cloaths, and the End of the Stump ſeem'd to be not above four or five Inches below the Trunk of her Body.

Since I have ſo frequently found the large Trunks of the Arteries of the Thighs and Legs of aged People petrified, as I have mention'd in the *Tranſactions* *; and moſt commonly in thoſe who have had Gangreens in the Legs, *&c.* I am apt to ſuſpect the like happen'd in the Crural Artery of this Woman; which, like a Ligature, did at length put a total Stop to the Influent Blood below that Stricture.

* Vid ſupra, *p.* 337.

Obſervations on the Fibres *of the* Muſcles, *&c. by Mr.* Leeuwenhoeck. *n.* 339. *p.* 55.

VII. 1.] I have made ſome Obſervations on the Membranes with which the *Fibrillæ* of the Muſcles appear to be encompaſſed, both in the Fleſh of a Whale, Cod-fiſh, Salmon and Smelt; and alſo in that from an Ox to a Mouſe; in all which the Appearance was the ſame.

The Fleſh of the Whale, was a ſmall Piece cut off near the Tail of the Fiſh, which I deſired a Sea-Captain to bring me, that I might obſerve how the Fleſh in that Part was joined to the Tendons in ſo large an Animal. Viewing this thro' the Microſcope, I judged the Fibres thereof to be four times as large as thoſe I had formerly obſerv'd in another Piece of Whale's Fleſh, taken from another Part of the Fiſh; which made me conſider, whether the Fleſh of that Part might not be, by Nature, furniſhed with larger Fibres for its greater Strength.

Cutting the ſaid Fleſh-parts length-wiſe, and a-croſs the Fibres, I diſcovered more plainly than before, that each Particle or Fleſh-fibre was enwrapp'd in a fine thin Membrane.

To have a better Idea of theſe Fleſh-fibres of a Whale, I cut a thin Slice of it a-croſs, which I laid on a wetted Piece of Glaſs, that the Fleſh which was very dry and ſhrunk, might, by the Moiſture be ſwelled, and thereby diſtended to the natural Size it had when on the Body of the Fiſh itſelf. In this State, placed before the Microſcope, it appear'd as in *Fig.* 181. in which the Parts were ſo cloſe together, that their encompaſſing Fig. 181. Membranes, repreſented by the black Lines, were but juſt diſcernable, ſome whereof appear'd larger than others: theſe, if attentively viewed, ſeem'd plainly to be divided into Multitudes of others, cut alſo tranſverſe, the Bigneſs of which was no larger than a common Sand to the naked Eye. Theſe were ſo cloſe crowded together, that their Figure was very irregular, as well as their Sizes different; for tho' each ſeem'd encompaſſed with ſix others, yet ſome of them were twice as large as the other.

Having formerly mention'd the Slenderneſs of theſe *Fibrillæ* in the Fleſh of a Whale, and judging theſe, as I ſaid before, to be four times as large, I took a thin Slice of the formerly mention'd Whale-fleſh (which I had ſtill kept by me) and after having made it thoroughly wet, I viewed it with the ſame Microſcope, as I had done this of the Tail. This appear'd as is repreſented *Fig.* 182. Letting the Moiſture dry away from theſe Fig. 182. Slices, ſo ſtuck on the Glaſs, the Particles became much ſmaller, and the Membranes with which each was encompaſſed, became very viſible; that is, thoſe which were not ſhrunk away; which was a very entertaining Object: and as often as I made new Cuts, a new Object preſented itſelf.

A ſmall Particle of this Fleſh I cauſed to be drawn, as in *Fig.* 183. Fig. 183. Theſe Particles ſeem'd to touch and be joined to others; but now being dried, they ſhrunk in from the Membranes round about them; for the Membranes could not ſhrink, becauſe they were all joined to one another.

Along theſe Fleſh-fibres there run ſome ſuch thick Membranes, that they equal the Thickneſs of a Hair or more, which are ſcarce diſtant the breadth of a Sand from each other; from theſe larger Membranes other Parts are ſpread, dividing each Fibre into numerous *Fibrillæ*; ſo that it may be ſaid, each Fleſh-fibre, no bigger than a Hair, is a little Muſcle encompaſſed in its peculiar Coat or Membrane. Whereas the Deſigner had not the ſame Apprehenſion of the Size of theſe Fibres, as I and ſome other Perſons had; I made him draw a little Piece as large as it appear'd to my Apprehenſion, as in *Fig.* 184. whence appears the Difference of one Man's Sight Fig. 184. from another.

I have alſo often ſeen ſome few of theſe Fibres, tho' joined to others, yet but one Fourth of their Bigneſs to which they were joined.

When I again moiſten'd thoſe repreſented in the 183d and 184th *Figures*, (dry'd up and ſhrunk) they would be again ſo ſwelled and diſtended, as to fill up the Spaces between the Membranes, and reaſſume the Shape they had before they were dried. Among ſeveral little Pieces of Fleſh placed before another Microſcope, and moiſten'd as before, there was one, whoſe Particles were not ſeparated upon drying, which I ſuppoſed to be, from the ſplitting and tearing aſunder of a large Membrane that run thro' the middle of it, as may be ſeen in *Fig.* 185. where between *S T* and *V*, Fig. 185. the dried Particles remain unſeparated; theſe being cut a little thicker, appeared alſo of a darker Hue, and if they had been ſliced yet thicker, would have appear'd of a dark red. By *S W* is repreſented the thick Membrane dividing this Piece, which was about the Bigneſs of a Hair; this at *T* ſent out a Branch, and near *W* is ſplit into two: I apprehend that a great Number of Blood-veſſels are ſpread over this Membrane, which by their Smallneſs are not viſible; for it is by theſe the Nouriſhment is convey'd. Between *R S* and *Q W*, the exceeding fine Membranes torn from the great are viſible.

Is it not amazing that in ſuch vaſt Animals as a Whale, ſuch exceeding ſmall *Fibrillæ* ſhould be found? Nay, ſuch they are in ſmall Animals; and that the whole 185th *Figure* is not ſo large as a coarſe Grain of Sand?

This Whale was ſo large, that the upper Part of its Body yielded 60 Quarteels of Blubber or Fat, which allowing 30 *Rotterdam* Stopes (making each about 3 *Engliſh* Quarts) to one Quarteel, it will nearly amount to 24000 Pound weight; beſide, there is a very great deal of Fat about the Entrails.

Fig. 186. Then I cauſed a very little Piece, conſiſting only of five *Fibrillæ*, to be drawn lengthwiſe, as they were ſeen thro' the Microſcope, as (in *Fig.* 186.) in which *Figure* at *A*, and a little at that Place, it is divided into two *Fibrillæ*: Between *C* and *F*, are to be ſeen the little Membranes which encompaſs the *Fibrillæ*, which are here torn aſunder.

I have frequently obſerved theſe Fleſh-fibres lengthways, to be as it were corrugated or wrinkled, which I imagined to be the Repreſentation of their Reſt or unbent Poſture; and yet more, when the Part to which they belong is bowed together, or brought nearer; but when the Muſcle is extended, and its Antagoniſt acts, there is not the leaſt Wrinkle obſervable in theſe *Fibrillæ*.

However, all the little Inequalities in theſe *Fibrillæ* muſt not be taken for thoſe Corrugations, ſince many of them are only the Particles torn off from the Membranes which encompaſs the *Fibrillæ*.

Fig. 187. *Fig.* 187. Repreſents four little Fibres of a Piece of Whale's Fleſh I had procured two Years ſince; this I cauſed to be drawn, to ſhew the Difference. By the two *Figures* 186 and 187, it is viſible that the Diameters of the Fibres are as big again in one, as in the other; therefore the Fibres muſt be four times as big in *Fig.* 186, as in *Fig.* 187. Now each Fleſh-fibre being compoſed of a great many ſmaller *Fibrillæ*, we may imagine each of theſe in-lying Fibres do likewiſe conſiſt of others of the like nature.

I have a-freſh viewed ſeveral ſmall Fibres of Ox-Fleſh, and obſerved, that each of the *Fibrillæ* in them was encompaſſed with a thin Membrane. But I cannot ſhew theſe Membranes ſo clearly to other Perſons in Cows-Fleſh, as in Whales-Fleſh, becauſe the Parts of the former are of a much more compact and cloſe Texture than that of the Whale, from whence they do not ſhrink ſo much in drying.

I am of Opinion, that what I have ſaid of the Membranes (encompaſſing the Fibres and *Fibrillæ*) of the Fleſh in a Whale, will likewiſe hold true in other kinds of Fleſh; yea even down to that of a Rat or a Mouſe; concerning which I ſhall proſecute my Obſervations.

2.] Mr. *Muys*,

Obſervations on the Texture of the Muſcles *by Mr.* Muys. *Extracted from the* Journal Literaire, *for* 1714. *ibid.* p. 59.

2.] Mr. *Muys*, of *Franequer*, has made ſeveral Diſcoveries in the Mechaniſm and Texture of the Muſcles of Animals; of which theſe are ſome.

He has obſerved, that the fleſhy Fibres of the Muſcles are compoſed of other ſmall Fibres, which he calls *Fibrillæ*; that theſe *Fibrillæ* are of the Size of a ſlender Hair, and that 500 or 600 of them may be counted in one fleſhy Fibre, whoſe Diameter is no more than the 24th Part of an Inch.

That each of theſe *Fibrillæ* alſo is made up of more than 300 little tranſparent *Tubuli*, but ſo ſlender, that if a Blood Globule (which according to Mr. *Leewenhoeck*, is but the 1,000,000th Part of a Grain of Sand) were divided into 24 Parts, one of theſe could hardly paſs thro' theſe ſmall Pipes.

He has ſhewn, that tho' the fleſhy Fibres of the Muſcles, are joined to the Tendons, and tendinous Membrane of a Muſcle; yet theſe tendinous Fibres are not a Continuation of the fleſhy ones, as moſt Anatomiſts ſuppoſe; which he proves thus: If by means of a wooden Knife, or only by pulling it, you ſeparate the fleſhy Fibres from the Tendon, the End of the Tendon to which they were joined, will remain ſmooth and even, and not rugged.

Having made ſeveral Injections of warm Water into the crural Artery of a Lamb of a Year old, all the fleſhy Fibres loſt all their Redneſs, and became entirely white. The Fibres being whiten'd by this Injection, he injected a coloured Liquor by the ſame Artery; and then not only the ſmall Arteries appeared filled with this tinged Liquor, but he found alſo that the Liquor paſt thro' each Fibre, either in a ſerpentine manner, or undulating, or framing ſeveral Angles, or joined by a great Number of *Anaſtomoſes*.

He obſerved alſo, that many ſmall Branches of the Arteries, which before could not be ſeen, appeared viſibly, ſpread all round the little *Fibrillæ*, and tinged with the ſame Colour.

Having remarked, that the Parts of the fleſhy Fibres, which were near the Extremities of the Arteries, appeared tinged with the Liquor; he examined them with a Microſcope, and found the little *Fibrillæ* filled and tinged with the ſame Liquor; and yet there was not the leaſt Appearance of the Liquor in the *Interſtices* between the *Fibrillæ*.

Having made Injections by the crural Artery, of another coloured Liquor, in the Muſcles, whiten'd, as before, with Water, he ſaw not only the Fibres in ſome of the Muſcles, and the moſt part of them in the others filled with this Matter; but having examined them with a good Microſcope, he found the *Fibrillæ*, and even the leaſt *Tubuli* which compoſe them, filled and tinged with the ſame Matter; and nevertheleſs the ſmall amifications of the Nerves appeared perfectly white.

It reſults from theſe Obſervations,

1ſt, That the little Tubes, which make a *Fibrilla*, are really hol- ow, and that the Extremities of the Capillary Arteries open into hem, and empty there a Part of their Liquor, which is re-conveyed y the Veins to the Heart.

2d, That the Blood Globules muſt be divided into an almoſt infinite Degree of Smallneſs, before they can enter and paſs theſe *Tubuli*. That the Blood Globules may be ſo divided, and when ſo divided paſs thro' the ſmall *Tubuli*, is evident from the Redneſs of the Fibres and *Fibrillæ* of Animals, which have a red Fleſh; which will be no Surprize to them who have read Mr. *Leewenhoeck*'s Letter 42, where he ſays, that theſe Globules do divide themſelves after this manner, to paſs thro' the laſt Extremities of the Capillary Arteries of the Brain; nor to thoſe who know, that the Globules are extremely ſoft and eaſily ſeparable, as Mr. *Muys* has evinc'd by Arguments grounded on very curious Obſervations.

Mr. *Muys* has alſo made ſeveral Diſcoveries of the Courſe and Ramifications of the *Nerves* in the Muſcles.

He has alſo found out a way to ſeparate the *Salts* in Human *Blood*, without any *Cymical* Analyſis, and without making them undergo any Change, and to form them into *Cryſtals*, viſible without a Microſcope; as he has ſhewn to his Students in Phyſic.

VIII. *Account of Books omitted.*

n. 291. *p.* 1597. 1. Epiſtola D. *Guilhelmi Muſgrave*, S. R. S. in quâ Ratio redditur Libri nuper Editi, cui Titulus, *De Arthritide Symptomaticâ Diſſertatio.* Auctore *Guilhelmo Muſgrave*, M. D. Coll. Med. *Lond.* & R. S. Socio, 8*vo.*

n. 310. *p.* 2435. 2. Epiſtola, in quâ Ratio redditur Libri nuper Editi, cui Titulus, *De Arthritide Anomalâ ſive Internâ*, Diſſertatio. Auctore *Guilhelmo Muſgrave*, M. D. Coll. Med. *Lond.* & R. S. Socio, 8*vo.*

CHAP. VIII.

Pharmacy. Chemiſtry.

A Problem *for finding the true* Doſes *of* Vomiting *and* Purging *Medicines. Propos'd* March 1704 *by Dr.* W. Cockburn, *n.* 293. *p.* 1752.

I. 1.] EXPERIENCE informs us how different the Operations of Medicines are, according to the Variety of Temperaments, Ages, and the different States of the ſame Age. But the Operations of Emeticks and Purgatives are more conſpicuous: So that the ſame which purges grown People but very mildly, is t much for Children: And Catharticks which to Day are but a juſt Do to Morrow may be too little or too much for us. Nay, thoſe wh differ only in Temper may exhibit all this Variety.

Since then there is ſuch an unconquerable Difficulty in aſſigning the d Doſe of evacuating Medicines; a Method were to be wiſh'd for, by whi we might adminiſter the ſame without this Uncertainty.

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The Author has inveſtigated this Method by demonſtrative Arguments, and has committed the ſame ſealed up to the Care of our Preſident.

Yet he intreats all Phyſicians to inquire what may be this or a like Method, that we may be directed herein without Error; and he will wait for their Solutions 'till the Calends of *March*, 1705-6. which then he will publiſh with his own.

— Solv'd *by the* ſame, *n.* 302. *p.* 2119.

2.] To determine the more juſtly what are the different Doſes of Emetic and Purging Medicines, according to the Variety of Temperaments and Ages, we muſt firſt ſuppoſe, that no ſuch Medicines can operate, before they arrive at the Maſs of Blood, and are intimately mixed with it. For it is plain, that 'till they excite a Nauſea, no ſenſible Effect is produced by them for a long time after they come there. *Secondly*, their more general Effect is, ſome Alteration of the Temper of the Blood, and of the other circulating Juices.

From theſe two Poſtulates we conclude, that, when the Craſis of the Blood is the ſame, the Doſes of the Medicines to produce ſome certain Effect ought to be proportional to the quantity of Blood. For if ſome certain Doſe is required to alter to a certain Degree the Craſis of one Pound of Blood, for Inſtance; then a double Doſe is required to alter two Pounds to the ſame Degree, a Treble for three Pounds, and ſo on. And univerſally, if the Quantity of Blood b require the Doſe d, the Quantity of Blood $m\,b$ will require the Doſe $m\,d$; for it is $b : d :: m\,b : m\,d$.

Coroll. Since the Quantity of Blood, and the other circulating Humours, may be rightly eſtimated from the Weight of the Animal, (for the Parts which we call ſolid are only the Canals containing thoſe Humours), it follows thence, that the Quantities of Doſes, when other Things are like, are proportional to the Weight. Therefore the Doſe of a Medicine to be given to a new-born Infant, is to a Doſe of the ſame for a full aged Man, as the Weight of the Infant to that of the Man. For Example, 30 Grains of *Pilulæ Rudii* are commonly given to a Man at one Doſe, and the uſual Weight of a Man is 160 Pounds, and of Infants 12 Pounds. Wherefore as 160 the Weight of a Man to 12 the Weight of an Infant, ſo are 30 Grains the Doſe of Man, to $2\frac{1}{4}$ Grains the Doſe of an Infant. And as the Infant grows bigger, the Doſes of Medicines are always to be increaſed in the ſame Ratio. Afterwards the Doſes to be given continue the ſame to the Age of 50; ter which Time the Quantity of Blood and the Strength continually creaſe, in which Proportion alſo the Doſes of Medicines are to be ſſened.

By this way of reaſoning we have ſuppos'd, that all Men are endued ith the ſame Temperament, and alſo that the Increaſe and Order of the cretions are the ſame when the Number of Years is equal; for this is e ſimpleſt way of conſidering this Matter. But as the Temperaments Conſtitutions of Men are very different, according to the different

Craſis of the Blood and circulating Humours, the Quantities of Doſes muſt not always be proportional to the Weight of the Body. This different Temperament of the Blood conſiſts in a certain Diſpoſition of the Parts to cohere together, by which the Blood becomes more or leſs fluid. From whence it proceeds, that the Operation of Medicines upon the Blood is different, according to the different Degrees of its Coherence. For let us ſuppoſe there are two Men having an equal Quantity of Blood, the Degrees of the Coherence of which are different. It is plain that Medicines will more eaſily mingle with the Blood of the more lax Texture, than with that of a more firm Coherence. And the Aptneſs which the Parts of Medicines have of mixing with the Particles of the Blood, is always as its Fluidity directly, or reciprocally as the Tenacity of the Blood, and the Efficacy of the Medicine upon the Blood will alſo be in the ſame Ratio. Therefore, that a Medicine may operate equally upon Men of this different Temperament, Doſes muſt be given that are proportional to the Tenacity of the Blood; ſuppoſing that the Blood circulates in both with equal Velocity. But if the Velocity of the Blood be different, the Operations of Medicines, that is, the Quantity of the Secretions produced by them, will be as the Velocity of the Blood. For the Secretions in any Gland in a given Time are always as the Quantity of Blood which is brought to that Gland in that Time, which is as its Velocity. Alſo the Velocity of the Blood, when other Things are alike, is always as its Fluidity, or reciprocally as its Degree of Coherence. If therefore the Velocity of the Blood were only to be conſider'd, in this Caſe the Quantity of the Doſes for producing the ſame Effect will be directly as the Degree of Coherence in the Particles of the Blood.

Prop. I. *In two Men having an equal Quantity of Blood, but which differs in the Degree of Coherence, the Doſes of Vomiting and Purging Medicines, which are neceſſary for producing the ſame Effect, are in a duplicate Ratio of the Degrees of Coherence of the Blood.*

For when the Blood moves with the ſame Velocity, the Quantity of the Doſe muſt be as the Degree of Coherence; and if the Degree of Coherence is the ſame, the Quantity of the Doſe is reciprocally as the Velocity; ſo that when neither the Coherence nor the Velocity are the ſame, the Quantity of the Doſe muſt be in a Ratio compounded of the direct Ratio of the Degrees of Coherence in the Blood, and the reciprocal Ratio of the Velocity. But the reciprocal Ratio of the Velocity is the ſame as the direct Ratio of the Tenacity or Degrees of Coherence. Therefore the Quantity of the Doſe is in a Ratio compounded of the Degrees of Coherence; and the Degrees of Coherence, that is, the Doſes to be given are in a duplicate Ratio of the ſame. *Q. E. D.*

Prop. II. *The Quantity of Doſes to be given to Men of a different Quantity of Blood, which alſo is endued with different Degrees of Coherence, is* *is in a Ratio compounded of the Ratio of the Weight of the Men, and the duplicate Ratio of the Degrees of Coherence.*

For when the Degrees of Coherence are the ſame, the Quantity of the Doſes is as the Weight of the Men. And when the Weight of the Men is the ſame, the Quantity of the Doſes is in a duplicate Ratio of the Degrees of Coherence. Therefore when neither of them is the ſame, the Quantity of a Doſe is in a Ratio compounded of the Ratio of the Weight of the Men, and a duplicate Ratio of the Degrees of Coherence. *Q. E. D.*

Coroll. Hence when we know the Quantity and Quality of the Blood in any Man, it will be no difficult thing to determine the Doſes that are neceſſary to purge or vomit him. This Quality or Temper of the Blood is eaſily found by a ſkilful Phyſician from his Pulſe, Urine, and other Secretions. So that by obſerving what Doſes will purge a Man of a given Conſtitution, a Phyſician with very little trouble may preſcribe the Doſes that are proper for any Conſtitution or Temperament.

Schol. What has been hitherto demonſtrated in general, would likewiſe follow from the common Hypotheſis of Phyſicians, about Purging and Vomiting. For the Diſpoſition which the Ventricle and Inteſtines have to Stimulation, is as the Degrees afore-mention'd of the Quantity and Coherence in the Blood. So that even from that Suppoſition this Truth would be very manifeſt, though it has not the Simplicity of a Poſtulate, and for that Reaſon is not apply'd.

3.] By my Solution of the Problem for determining the due Doſes of purging and vomiting Medicines, in all their Caſes, it is manifeſt in general, that theſe Medicines operate either upon the account of their being mixed with the Blood, or by their ſtimulating the Stomach and Guts. 2. That this their Operation is more or leſs, according to the Quantity and Thickneſs of Blood, *h. e.* a greater Quantity, and the thickeſt Blood, require the greateſt Doſes. And, 3. That when the Quantities of Blood are the ſame, the Doſes of Purging and Vomiting Medicines are in a duplicate Proportion of the Blood's Thickneſs. As alſo, that in every Caſe theſe Doſes muſt be in a Proportion compounded of the Quantity of Blood and thoſe Squares of its Thickneſs.

—*The* Practice *of thoſe* Medicines; *with* Tables *of the* various Doſes, &c. *by the* ſame. *n.* 314. *p.* 46.

Now ſince the Operations of Purgative and Vomitive Medicines depend ſo much on the Quantity and Viſcidity of the Blood, which have not been duly conſider'd before; it is no wonder that the Practice of hyſic in theſe Evacuations has been ſo uncertain, and that the moſt ex-rt Phyſicians, from their moſt accurate Obſervations, could never de-mine the true Doſes of Medicines, which alter ſo much according to e various Subjects they work upon; they not being acquainted with the ie Method of determining either the Quantity of the Blood, or the De-ees of its Thickneſs.

The Doſes of theſe Medicines why ſo hard to be found.

Becauſe Experience is equally the Foundation and Touchſtone of all eaſoning in Phyſic, we will here ſubmit our Solution to common Obſervations.

ſervations, and try whether every thing propoſed in it, does not exactly anſwer Matters of Fact, and the viſible Operations of Nature.

The different Effects *of theſe* Medicines *upon the account of their* Forms.

Firſt then, it plainly follows, that theſe Medicines always purge beſt and moſt conſtantly in a liquid Form; becauſe they are more eaſily convey'd into the Blood, and can ſtimulate more Parts, and that upon the account of this their Fluidity; whatever may be the way that Purges and Vomits work, or whatſoever their Nature may be. This explains very eaſily a very common Obſervation, hitherto very difficult to Phyſicians, about the different Operation of the ſame Medicine in different Forms: *viz.* Why the Infuſion of a due Quantity of a purging Medicine produces its Effects ſooner and more conſtantly than a like Quantity of the ſame Medicine in a Powder, though ſtill more conſtantly in a Powder than a Bolus; though ſtill ſooner and more conſtantly in a dry Bolus, than if it be given in Pills made into that Form with Gums that do not purge; and this Difference in purging ſhall even be notable, according to the Diſſolubility of the Gums.

From whence it follows, that the Evacuation made by ſuch Medicines is in Proportion to the Quantity of thoſe Medicines that happens to be diſſolv'd, and not to the Quantity adminiſter'd,

Secondly, That purging by Draughts is the moſt excellent Form, and will always have the moſt conſtant Effect.

Their Effects different, *because of the different* Thickneſs *of Blood*.

The next Conſideration is, That a certain Quantity of any purging Medicine affects us after a different Manner, according to the different Quantity and Conſtitution of the Blood, or its Thickneſs; and it was ſhewn in the Solution, that if its Thickneſs were the ſame, the Doſe ſhould always be as its Quantity; but the Blood differing likewiſe in Thickneſs, the Doſes of Purging and Vomiting Medicines muſt be augmented on account of its Thickneſs. This is confirm'd by daily Experience; where we find, that People ſick with a manifeſt Thickneſs of Blood, as in Dropſies, the Jaundice, &c. take far greater Doſes than they did at any other time when they were not ſick, or in that Manner.

By a further Diſquiſition into this Matter, we find that the Doſes muſt not only be greater where the Thickneſs of Blood is greater, but that they muſt be increas'd in a duplicate Proportion of their Viſcidity. This is evident by the Tables in *Caſſia. viz.* 9 : 8 ʒ :: 4 : 3 ʒ, 1 ℈, 13⅓ *gr.* and therefore *alternando* 9 : 4 :: 8 ʒ : 3 ʒ, 1 ℈, 13⅓ *gr.* Therefore the Doſes are as the Squares of the Conſtitutions. So likewiſe 9 : 8 ʒ :: 16 : 14 ʒ, 13⅓ *gr.* and *alternando* 9 : 16 :: 8 ʒ : 14 ʒ, 13⅓ *gr.* *h. e.* the Doſes are as the Squares of the Conſtitutions.

The ſame is true in any other Conſtitution beſides the mean: For Ex ample, in the loweſt and higheſt 4 : 16 :: 213⅓ *gr.* : 853⅓. So that b this means we are not only led directly to a right Uſe of theſe Medicine and are able to find the true Cauſe why the ordinary Doſes produce ſ very different Effects in different Conſtitutions; but likewiſe, *The Qua tity of Blood in any Perſon being given, together with the ordinary and e traordinary Effect of a Doſe of a purging Medicine, the Change of that Pe ſon's Conſtitution, and the Nature of that Change, may be determin'd.*

A Problem.

I

This Doctrine true, becauſe conformable to Nature.

It cannot but be a great Satisfaction to the Mind, to find a Doctrine founded on a few ſimple Experiences leading us into the Cauſe of many more that are very complex, difficult, and obſcure; which is ſufficient to prove its Conformity to Nature. But my preſent Endeavour being to rectify the common Practice of theſe Medicines by this Doctrine, I ſhall frame, by this Method, Tables of the Purging and Vomiting Medicines in preſent Uſe; better adapted to Experience ~~than are~~ hitherto ~~to be found~~.

How the Tables made.

The Method of framing ſuch Tables, is by ſetting off the practicable Conſtitutions in the different Ages that I have obſerv'd to take notable Quantities of Purging and Vomiting Medicines; ſo that by comparing theſe Conſtitutions with the Ages, we have the different Doſes in all thoſe Caſes, which is all that is required for a better Practice; though a more proper Occaſion may produce a more nice and exact Diviſion of Conſtitutions, very much to the Advantage of the Practice of Phyſick in all Diſeaſes.

The Ages wherein theſe different Doſes are taken, I find to be four; when a Man is about 16 or 20 Years of Age, and weighs about 12 Stone, he then takes the common Doſe; one of nine Years takes three quarters of that, one of ſix the half, and one of three Years a quarter. † Moreover it having been ſhewn, that the notable healthy Conſtitutions are but three, as alſo the notable Pulſes of each of theſe; let then theſe Conſtitutions be as 2, 3, 4. That of the moſt fluid Blood, as the firſt Number, and ſo on; in that Caſe, the Doſe of any Perſon will be found by multiplying the common Doſe for his Age into the Square of his Conſtitution, and dividing by the Square of the middle Conſtitution. For Inſtance: If ℥j. *Caſſiæ* is the common Doſe, or the Doſe of the middle Conſtitution, ʒiij. ℈j. and *gr.* 13 $\frac{1}{3}$ is the Doſe of the firſt Conſtitution, and ʒxiv *gr.* 13 $\frac{1}{3}$ that of the groſſeſt or laſt Conſtitution; and ſo proportionably for every Medicine in all the Ages, as appears by the Tables.

† *Oecon. anim.* p. 51. *Biblioth. Anatom.* p. 1124. *Tom.* 2.

One Exception.

This Method ſeems to anſwer ſo exactly, that there is not any thing neceſſary beſides, except a Perſon is more looſe or coſtive than ordinary (which may be known from the Patient) or otherways it is to be reputed the ſame, as if he had taken an equivalent Quantity of a Medicine proper to produce theſe Effects. Any Phyſician, who has conſider'd this Caſe in ſome People after Fluxing, will allow the Juſtneſs of this Exception.

The Doſes of Vomiting Medicines.

As Vomiting Medicines have the ſame common Doſes with thoſe that Purge, they admit alſo of the like divided Doſes; which, therefore, may be found by the ſame Tables. Only, as People that are more coſtive than ordinary, require a proportionable greater Doſe of a Purging Medicine; ſo they require their Doſe of a Vomiting Medicine to be conſiderably leſs, as is very well known in hot Countries.

It muſt be obſerv'd, that in the Tables, *Age* ſtands inſtead of *Quantity of Blood*; becauſe they increaſe pretty equally, and it makes the Practice more eaſy to ſuch as are not accuſtom'd to Weights and Numbers. And,

The more Skilful are deſired to obſerve, that in the mean Ages, multiplied into the mean Conſtitutions, give Doſes more nicely.

	Medicines.	Ages.	Constitutions	Doſes.				Medicines.	Ages.	Constitutions	Doſes.		
				ʒ	℈	Gr.					ʒ	℈	Gr.
Medi-	*Caſſia, Catbo-*		2	3	1	13⅓	*Common*	*Agaric. Aloe.*		2	0	1	6⅔
cines	*licon, Dia-*	16	3	8	0	0	*Doſe* ʒj.	*Carthamus*	16	3	1	0	0
whoſe	*carth. Elect.*		4	14	0	13⅓		*Ebuli ſem.*		4	1	2	6⅔
common	*lenitiv, Suc-*							*—Cortex.*					
Doſe is	*cus rad. Irid.*		2	2	2	0		*Hermodact.*		2	0	1	0
℥j.	*—Fumariæ.*	9	3	6	0	0		*Mechoacan.*	9	3	0	2	5
	Syrup. de		4	10	2	0		*Pil. Aggre-*		4	1	1	0
	Rhamno.							*gat.*					
	—de Pomis		2	1	2	6⅔		*—Coch.*		2	0	0	13⅓
	magiſtr.	6	3	4	0	0		*maj.*	6	3	0	1	10
	—Roſar.		4	7	0	6⅔		*—Fætid.*		4	0	2	13⅓
	cum Helleb.							*—ſine Qui-*					
	Tamarind.Sal		2	0	2	13⅓		*bus. Pulv.*		2	0	0	6⅔
	cathart.amar.	3	3	2	0	0		*Diaſennæ.*	3	3	0	0	15
	—Mirabile.		4	3	1	13⅓		*Rhabarb. Sol-*		4	0	1	6⅔
	Man. ℥ij.							*danel. Senna.*					
	Emetica *Vin.*							*Turbith.*					
	emet. ſeu Be-												
	ned. Succ. A-												
	ſari. Senecio-												
	nis.												
			2	1	2	6⅔				2	0	0	13⅓
		16	3	4	0	0	*Common*	*Jalappa. Ju-*	16	3	0	1	10
			4	7	0	6⅔	*Doſe*	*li. jugland.*		4	0	2	13⅓
							ʒ ß.	*Lap. Lazuli.*					
Common	*Confect. Ha-*		2	1	1	0		*—Armen.*		2	0	0	10
Doſe	*mech. Elect.*	9	3	3	0	0		*Opoponax.Pil.*	9	3	0	1	2½
℥ß.	*Caryocoſtin.*		4	5	1	0		*Coch. min.*		4	0	2	0
	Diaphænicon.							*—de Gut. Ga-*					
	E ſucco Roſa-		2	0	2	13⅓		*mandra.*		2	0	0	6⅔
	rum. Emet.	6	3	2	0	0		*—Rudii. Pul.*	6	3	0	0	15
	Syrupus eme-		4	3	1	13⅓		*Warvicenſ.*		4	0	1	6⅔
	ticus.							*Sagapen.*					
			2	0	1	6⅔		Emet.		2	0	0	3⅓
		3	3	1	0	0		*Rad. Ipeca-*	3	3	0	0	7½
			4	1	2	6⅔		*cuana.*		4	0	0	13⅓

Medicines

	Medicines.	Ages.	Conſtitutions	Doſes. ʒ	℈	Gr.
Common Doſe is ℈j.	*Reſina Jalappæ. Extr. rhabarbari.* *Pil. de Hermodactylis* ℈ij. *Pulv. Cornach.* ℈ij. Emet. *Gilla vitrioli.*	16	2	0	0	8
			3	0	1	0
			4	0	1	15 5/9
		9	2	0	0	6⅔
			3	0	0	15
			4	0	1	6⅔
		6	2	0	0	4 4/9
			3	0	0	10
			4	0	0	17
		3	2	0	0	2 2/9
			3	0	0	5
			4	0	0	8 8/9
Common Doſe Gr. 6.	*Colocynthis* *Euphorbium* *Eſulæ Cortex.* *Elaterium* *Gum Guttæ* *Gran. Gnid.* *Ricini ſem.* *Scammon.* *Tr. Alband.* Emet. *Croc. Rulandi* *Turbith minerale.*	16	2	0	0	2⅓
			3	0	0	6
			4	0	0	10⅔
		9	2	0	0	2
			3	0	0	4
			4	0	0	8
		6	2	0	0	1
			3	0	0	3
			4	0	0	1⅓
		3	2	0	0	0
			3	0	0	1½
			4	0	0	2⅔

	Medicines.	Ages.	Conſtitutions	Doſes. ʒ	℈	Gr.
Common Doſe Gr. 3.	Emet. *Hep. Antimon.* *Vitr. Antimon.* *Merc. vitæ* *Tart. emet.* *Merc. præc. per ſe.* *—Solar.* *—ruber.* *Hercules Bovij.*	16	2	0	0	1⅓
			3	0	0	3
			4	0	0	5⅓
		9	2	0	0	1
			3	0	0	2¼
			4	0	0	4
		6	2	0	0	⅔
			3	0	0	1½
			4	0	0	2⅔
		3	2	0	0	⅓
			3	0	0	¾
			4	0	0	1⅓

Authors Copy, but do not Obſerve.

The Doſes of the foregoing Tables, ariſing from Calculation, agree perfectly well with the common Obſervation of the beſt Authors; tho' their Obſervation is very general and ill made, if we except the very firſt Steps. For inſtance, Authors of all Countries, *Engliſh*, *Dutch*, *German*, *Italian* and *French*, reckon the Doſes after the ſame manner; whereas, if they had been obſerv'd, they muſt have been different as are the Conſtitutions of Men in the different Countries.

The Defect of their Obſervation is manifeſt by the diſproportion'd Doſes of ſome Medicines, their high Doſes being ſometimes double and ſometimes triple, and more of their low Doſes, which is not conform to Nature; for, let the low Doſe be what it will, the high Doſe of one Medicine muſt always bear the ſame Proportion to the high Doſe of another, as did their low Doſes, *viz.* even in Manna, they reckon it from ℥j. commonly to ℥iii. and ℥iv. If it is ſaid that the firſt Doſe is the loweſt Doſe that is taken by a Man of a due Age, it is neither true in fact, nor conform to their own way of reckoning: For Inſtance, Rhubarb is ſaid to be taken from ʒj. to ʒij. No body will ſay that this is the loweſt Doſe taken by a Man of a due Age as formerly, becauſe it is not in fact true; nor that the high natural Doſe is ℥ß. for if ℥j. of Manna and ʒj. of Rhubarb are the reſpective low Doſes, then ℥iv. and ʒij. cannot be the reſpective high Doſes. As to what concerns ſome extraordinary Doſes given by themſelves, and far exceeding the ordinary Doſe, it is eaſily accounted for by the Solution. There are many Examples of this Nature: Turbith, *viz.* is commonly reckon'd among them from ʒj. to ʒij. yet *Margravius*, and good Authors, have given it to ʒiv. So *Colocynthis* from *gr.* vi. to *gr.* xij. and *Fulgin. Fernel. Duncan.* ſay they have given it to ʒß.

They have only given the Doſes for Men at full Age.

Authors have been far from being exact; for they have only dos'd theſe Medicines for People of full Age; but have left the Doſes of the different Ages in Silence: nor have they told us at what time a Man takes his higheſt Doſe, or how that alters in the Growth and Decline of Age, which is ſtill a very great Difficulty for the moſt experienc'd Phyſicians to manage.

Their Way of determining Doſes falſe.

Their general Method is founded in a Miſtake; their loweſt Doſe being really the common Doſe taken by the Generality of Men, which produces a multitude of Errors in the Practice. This is manifeſt in their doſing every Medicine.

This ſhewn particularly.

The mention'd Caſe is more manifeſt by theſe Tables, and it is two to one but that a Phyſician over-purges or under-purges any Perſon in Health; and if more Caſes in Sickneſs are ſuppos'd, the Odds will increaſe proportionably. Experience confirms this exactly: For if the middle Doſe is given to one of the loweſt Conſtitution, and the middle Doſe is to purge 7 or 8 times; in that Caſe, the Perſon of the loweſt Conſtitution is purg'd near twice as much as he ought to be; and if given to one of the higheſt Conſtitution, he is purg'd but half of what he ſhould be. But if the Doſe of the higheſt Conſtitution is given to one of the middle Conſtitution, he is purg'd twice as much as he ought to be; and if given to one of the loweſt, he is purg'd four times as much, or about thirty times, as we find true by daily Experience. But if the Quantity of Blood, the Age, or Sickneſs contribute to the Error, it may prove fatal. If this Conſideration were illuſtrated by a proper Number of Examples, we ſhould find ſome hundreds of otherways unavoidable Miſtakes now prevented by the Practice of theſe Tables.

Laſtly, We may eaſily account, by theſe Tables, for the Doſes of Children, over-purging ſome People of good Health, and of a due Age; a *Phænomenon* ſo ſurpriſing, that the Smallneſs of the Doſe is commonly thought a good Excuſe for the Miſtake.

Of the Principles *of* Purgatives, *&c. by Monſ.* Bolduc. *n.*278.*p.*1099.

II. Monſieur *Bolduc* acquainted the Aſſembly of the Academy (of Sciences in *France*) that he had examin'd the Principles of Purgatives, and began with *Ipecacuanha*, which he ſaid he had endeavour'd to ſweeten and qualify, by trying to take away its too great *Emetic* Power. He aſſerted, that how violent ſoever *Ipecacuanha* be, yet it is not ſo dangerous as *Scammony* or *Coloquintida*, which always leave Gripes, and ſometimes *Dyſenteries*; whereas *Ipecacuanha* leaves only a gentle Aſtriction after it. He ſaid next, that, having obſerv'd that the *Emetic* Force of this Root conſiſts in its *Reſinous* Parts, he had found out a way to take them from it, and to leave only the *Saline* Parts; that he made uſe of Spirit of Wine to extract the one, and of Rain-water diſtilled to draw off the other; that he had afterwards given, with very good Succeſs in *Dyſenteries*, this *Ipecacuanha* ſo deſpoiled of its *Reſinous* Parts. From *Ipecacuanha* he paſſed to *Hellebore*, which is another violent *Emetic*; which he diſtinguiſh'd into two ſorts, the Black and the White. He ſaid, that ours was not different from that of the Ancients; that the White caus'd mortal Convulſions, for which reaſon it was not uſed, and that he had never made any Attempts with it. As for the black *Hellebore*, it is to be obſerved, that that which comes by the way of *England* is much weaker than that which grows on the Mountains of *Switzerland*; which may well have been the Reaſon that Phyſicians have neglected this Remedy. He ſaid, that having put it in a Retort in a Reverberatory Fire, he at firſt drew off an acid Spirit, next an oily-acid Spirit; thirdly, a violent *Alkali* Spirit came over mix'd with Oil of *Tartar*; and laſtly, a fœtid Oil. That from the *Caput mortuum* he had, by a *Lixivium*, a fix'd Salt, which fermented with Acids, ſuch as all other Plants give: Beſides theſe Operations, he drew an *Extract* of this Root with Spirit of Wine to get the *Reſinous* Parts, and with diſtilled Rain-water for the *Saline*. He got but very few of the former, but a great deal of the other; ſo that he found that Spirit of Wine was uſeleſs in this Caſe. Comparing then the Effects of theſe Purgatives, he ſaid that the purely *Reſinous* purge little, and with much Irritation; that the purely *Saline* purge only by Urine, but that both join'd together purge very well. That it is for this reaſon that *Phyſicians* make uſe of Salt of *Tartar*, to correct the bad Effects of *Reſinous* Purgatives; but if this Precaution were uſed, to make the Extract with *Aqueous* Diſſolvents inſtead of the *Sulphureous*, there would be no need of that Corrective.

Of the Root Pareira Brava; *by Dr.* Helvetius. *n.* 346. *p.* 365.

III. The *Pareira Brava* is a Root which comes to us from *Brazil* by the way of *Liſbon*, but which the War has render'd pretty ſcarce; however, it is to be found among the good Druggiſts, and is ſold at *Paris* for 40 *Livres* the Pound: 'tis call'd in *Brazil* the Univerſal Medicine, and is made uſe of there in all kind of Diſtempers. A Capuchin Monk, who came from thence, told me that he could not give it a greater Character than by aſſuring me, that in all their Voyages they carried the Goſpel in one Pocket, and the *Pareira Brava* in the other.

This Root is good to reſtore the Digeſtions, to the end, that in the firſt Paſſages there may not be form'd ſo much Phlegm and acid Crudities; and it is alſo neceſſary to hinder the Seroſity of the Blood from ſpreading itſelf too much upon the Parts. Now as Experience ſhows us that the *Pareira Brava* does abundantly provoke Urine, it will follow from thence, that it will diſcharge by the Kidneys the corroſive Acidity of the Maſs of Blood; it is alſo good to break and thin the pituitous and viſcous Humours; and it cures the Suppreſſions of Urine occaſion'd by Obſtructions in the Kidneys.

One may conclude from hence, that the Salts of the *Pareira Brava*, which are moderately Volatile, are proper to diſſolve or ſeparate the too thick and too cloſe Texture of the Sulphur of the *Lympha*. This Medicine has a light or gentle Bitterneſs, which corrects the Acids of the Stomach, and renders them more pure and fine.

Hence the Chyle becomes better digeſted and more balſamic, and fitted to aſſimilate itſelf with the Blood, and to preſerve therein that degree of Diviſion and Fluidity, which is neceſſary for it.

The Method of uſing this Root with Succeſs, is to reduce it to an impalpable Powder, and to infuſe thereof the Weight of a Demi-gros in a Pint of boiling Water, and let it lie in it all Night, and next Morning boil it one moment. Then pour the Liquor off gently from the Powder, and take of it a Demi-ſetier in two Cups with a little Sugar as hot as Tea, putting into each Cup 5 Grains of the ſaid Root reduced to an impalpable Powder, which you muſt ſtir with a Spoon, that none of it may remain at the bottom. You may repeat the ſame

Doſe about four Hours after Dinner, but you muſt not eat any thing within an Hour after you have taken it.

This Medicine does not oblige Perſons to alter the ordinary Courſe of their Living; and one may continue the Uſe of it ſeveral Months together, in which time alſo it may be diſcontinu'd two or three Days together at a time: but it is proper to take ſome gentle Purge every Fortnight or three Weeks during the Uſe of the ſaid Medicine.

The following Preparation was uſed by *Monſieur Duyvenhoorde*, Embaſſador Extraordinary from the *States-General*, who communicated this Account to the *Society*.

Take 11 Grains of this Root, and put it into a Pewter Tea-Pot filled with boiling Water, and ſo let it infuſe all Night over warm Aſhes, or a very ſmall Fire; and in the Morning boil it again, but very gently, 'till you uſe it: you muſt drink it as you do Tea, and the Liquor which comes from that Infuſion muſt not exceed the Quantity of 5 ſmall Diſhes of Tea.

The Preparation *of the* Root.

IV. A Gentlewoman of 54 Years old, who for a long time had been tormented with frequent Fits of the Stone, and uſually brought off many, with the Gravel, *&c.* about a Year ſince grew Dropſical, of which being lately cured, ſhe fell into a total Suppreſſion of Urine, which many Days baffled all Remedies.

Of the Internal *Uſe of* Cantharides; *by Mr.* J. Yonge. *n.* 280. *p.* 1210.

In this deſperate Condition, about 4 in the Afternoon, the 5th Day of the Diſeaſe I gave her 5 *Cantharides* (without Heads, Wings, or Legs) weighing 4 Grains and a half, and with as much Camphire and a little Conſerve, made them into two Pills or Bolus's.

Next Morning I found no Effect good or bad, but about Noon the Flood came, and continued about 48 Hours, bringing off in that time much more Urine than could have been expected from her in the whole time of the Obſtruction.

Some Gravel, and *Sabulous* Matter came away, but no Stones, nor did there any thing happen to the Stomach, Bladder, or other Bowels, as uſual, on the internal Uſe of thoſe Inſects; but they operated ſo quietly, as if nothing but two Doſes of *Lapis Prunellæ* had been adminiſter'd.

In ſeveral Caſes I have often and ſucceſsfully given it, and without the *Dyſuria* and other painful Accidents which attend the Internal (oftentimes the External) Uſe of this Remedy; altho' I mix'd no *Camphire*, but waſh'd it down with large Draughts of Poſſet, Ptiſan, Emulſions, or Water-gruel; which in the Lady's Caſe I forbore to uſe, becauſe of her dropſical Diſpoſition, and uſed only a Draught or two of middling Ale, impregnated with *Broom*, *Juniper-berries*, *Daucus-Seeds*, &c.

The Form, in which I uſed to adminiſter it, is that of a ſoft Pill or Bolus, compoſed of 3 *Cantharides* prepar. *Troch. e Myrrha* ℈ß *Sem. Ammeos* gr. vj. *Rob. Cynoſb.* q. ſ. *This* in ſtubborn Suppreſſions of the *Lochia* and *Menſtrua*,

Menſtrua, in difficult Child-birth, and Retention of the *Secundine*, does Wonders; what Heat or Pain it begets in the Neck of the Bladder, is much ſhort of what I have an hundred times ſeen, (and ſometimes felt) to proceed from applying an Epiſpaſtic to the Back.

About twenty Years ſince, an enamoured Youth attempted to gain a Girl's Love, by giving her a Plumb-Cake, in which powder'd *Cantharides* was mixed; ſhe eat Part of it, and gave three others of the Family in which ſhe lived a Share; they were ſoon tormented with burning in the Stomach, bloody and ſcalding Urine, and great Pain in the Back. I cured them all in a ſhort time, by Powder of *Ammeos* and *Lapis Prunellæ*, and Emulſions *Aq. Sperm.* R. *&c.* How many *Cantharides* each devoured in the Bread, I could gueſs by a Piece of it which remained, and ſuppoſe that viij or ix Grains fell to a Share.

Olaus Borrichius, Act. Med. *Barthol.* Vol. 4. Obſ. 80. gives a Chymical and Microſcopical Examen of thoſe Flies; he ſaith, their Parts ſeparated by Chemiſtry do not affect the Skin; that the Points of their Particles wound it; and that thro' thoſe little Wounds the Volatile Salt inſinuates: he attempts alſo to ſhew how they cauſe a *Dyſuria*, and offend the Bladder, when applied to a Part ſo remote as the Back or Neck. See more from the ſame Hand, in the 5th Vol. Obſ. 89.

Obſervations on the Claſs *of* Sweet Taſtes *in* Plants, *with* Remarks *on* *Mr.* L'Emery, *&c. by Sir* John Floyer. *n.* 279. *p.* 1160.

V. By our Taſte we may diſcern all the Chemical Principles in Plants before their Diſtillation; and for want of a due Obſervation of their Taſtes, Mr. *L'Emery*, (in his Treatiſe of Drugs) has not fully deſcrib'd the Chemical Principles which Plants do yield in Diſtillation.

All *Watery* Plants ſhew their Phlegm as well to the Taſte as in Diſtillation; and in all dry *Woody* Taſtes we obſerve, the Earth as well as we can by the Chemical Analyſis.

By the Mucilage and Gummineſs, or *Oily* Taſte, we diſtinguiſh the Oil of Plants, as well as by Diſtillation.

The *Aromatical* Smell ſhews us the Volatility of the Oil, and Salt of Plants; and by the *Fœtidneſs* we alſo know, that the Oil and Salt are in a Volatile State.

By the *Acrimony* and Pungency we know that there is a Volatile Salt in Plants; and by the *Burning* Taſte we know there is a Corroſive Salt in them.

By a *Crude* rough *Acidity* we obſerve the Tartar, or Eſſential Salt of Plants; but if the Acidity be of a *Vinous* Smell, we obſerve that 'tis of a middle State of Digeſtion, and may be call'd a Vinous Tartar, and the Crude Tartar an Acerb Tartar; but if the Tartar had a pungent Smell, then 'tis a Volatile Tartar, or Acid Acrid Tartar.

I will next deſcribe the Principles obſervable in Sweet Taſtes, and their ſeveral Claſſes; but muſt firſt obſerve that Sweet Taſtes ſhew their Oil by their ſlimy Smoothneſs, and their Tartar is evident in their Extracts, as in the Juice of Liquorice.

1. The *Graſs* Sweets, as *Gramen caninum*, have much eſſential Salt and moderate Oil; *Juncus*, *equiſetum*, *arundo*, *typha*, *nymphæa*, are all of the Ruſh kind, ſweet and rough, and ſome of them have more Oil, others more Acid, and that the moſt crude have more Oil than Tartar.

2. The *Corn* Sweets, as Barley, Rye, Wheat, Oats, Rice, Millet, have much Oil and eſſential Salt, and a little Volatile: So Bread yields Oil, and Eſſential and Volatile Salt.

Note, That Fermentation or the Fire produces the Volatile Salt, by exalting the Tartar into a Volatile Salt; and the ſlimy Mealineſs in Corn ſupplies the Oil. *Tragopogon* and *Scorzonera* are referable to the Graſs, and contain much Oil, and eſſential Salt.

3. The *Subacrid Sweets*, as *Rampions*, *campanula*, *trachelium*, contain much Oil and eſſential Salt, but the Acrimony in theſe Plants ſhews a Volatile Salt not deſcribed by the Chemiſt.

4. The *Ferns* contain Oil and Eſſential Salt, as *Polipody*; but the Acrid Principle is not obſerved by the Chemiſt, nor the Fragrancy in *Harts-Tongue*. *Oſmunda* and the *Capillaries* have more Oil than Salt, becauſe more mucilaginous and crude.

5. All the *Leguminous ſlimy* Sweets have more Oil than Tartar, but all much of both, as Broom, *Ononis*, *Aquilegia*, *Fumaria*, Aſparagus, *ruſcus*, *thalictrum*, *polygonatum*, *Senna*, *galega*, *lathyrus*, *luteola*, *periclymenum glycirrhiza*, *pſyllium*, much Oil, and Volatile or Eſſential Salt.

Beans and *Peas* and *Lentils* have alſo a Volatile Salt and *lens aquatica*. Note, That ſince there is no Acrimony in theſe Seeds, the Volatile Salt is produced by the Fire.

The Aromatic *Legumens*, as *Meliolotus*, have an exalted Oil and Eſſential Salt.

Periclymenum is deſcribed to have only Eſſential Salt and Oil; but ſince there is an Aromatic Odour in the Flavour, and a great Acrimony, there muſt be ſome Degree of Volatile Salt in it.

Fenugreek and Meadow *Trefoil* have much Oil and a little Salt, and ſo has *Ophiogloſſum*, *pinguicula* & *conſolida regalis*.

6. The ſweet *Nuts*, as *Almonds*, have much Oil and Eſſential Salt; but the *Bitter* have more Salt than the ſweet Almonds: Therefore 'tis probable that the *Tartar* abounds more in all Bitters, and that Tartar is the Effect of a higher Digeſtion; and the crudeſt Taſtes, as Styptics, Sweets, and Slimes have leaſt of it. So *Cheſnuts* and *Beech-nuts* have much Oil and little Salt. *Filberds* are deſcribed to have Eſſential Salt, and a little Volatile as well as Oil; but it ſeems no Probability that one may have it, and none in any of the other.

7. The *Sweet Acid* or Vinous Taſtes have much Oil and Eſſential Salt, as Prunes, Cherries, Strawberries, Raſberries. The Variety of the Taſtes of theſe Fruits ſhews the different Digeſtions and Mixtures, tho' the Principles are the ſame.

The Sweet *Viſcous* Fruits, as *Sebeſtens*, have little Eſſential Salt and much Oil.

8. The ſweet *Aromatic* burning Taſtes contain a Volatile Salt and Oil, as *Schœnanthus*, Ginger, Zedoary, Cubebs, Cardamums, *Vanillas*, *contrayerva*, *calamus aromaticus*; but theſe following are miſtaken by the Chemiſts, who ſay that *Coſtus amarus*, *dulcis*, *cyperus*, *galanga*, *Orris* have not a Volatile Oil, but Eſſential Salt only: for Orris is Acrid and Aromatic as well as the reſt; and therefore there is both Volatile Salt and Oil in them, and alſo an Eſſential Salt from their Sweetneſs.

9. The ſweet *Acrid Aromatics* of the *Fennel* Claſs have all a Volatile Salt and a Volatile Oil, as Angelica, Lovage, Parſly, *Meum*, Dill. Note, The Leaves and Roots of Fennel contain a Volatile Oil and Eſſential Salt, the Seed a Volatile Oil and Salt; but ſince the Roots and Leaves have a pungent Taſte, there is alſo a Volatile Salt in them, tho' the Chemiſts do not obſerve it.

All the Parts of *Caraways* have the Odour of Punaiſes, except the Seed; from whence I may infer, that the fœtid Plants have the ſame Principles as the Aromatics, *viz.* a Volatile Oil and Salt; and this is confirm'd by other *Fœtids* which have them, as Rue and *Aſſa fœtida*, and *Vulvaria*. *Peucedanum* is deſcribed of a bitter acid Taſte, with the Odour of Pitch, and muſt have a Volatile Salt, tho' *L'Emery* deſcribes only its Eſſential Salt and Oil: So in *Smallage* he deſcribes only the Eſſential Salt and Oil, but its Acrid Taſte manifeſts the Volatile Salt.

10. The *Sweet Gums*, as Manna, Sarcocolla, contain much Oil and Eſſential Salt; tho' Honey and Sugar have more Eſſential Salt than Oil: by which we may obſerve how much Eſſential Salt is in all Sweets, and why they are apt to turn ſour and ferment; and from ſuch ſweet Gums all ſweet Plants have their Acid and Oil upon Diſtillation.

11. Citruls, Melons, Gourds, Cucumbers, which are *Bitter Sweets*, and very *mucilaginous*, contain much Oil and little Salt.

Since the whole Claſſes of ſweet Plants contain an Oil and Eſſential Salt, ſome more, ſome leſs of both; the Virtues of the ſeveral ſweet Taſtes can never be explained by the Chemical Principles, and no new Virtues by them are diſcovered: therefore all the Advantage we have obtained by theſe Chemical Diſtillations is only to ſhew the Nature of Sweetneſs in general, by diſcovering the Principles contained in ſweet Plants; and this is a greater Advantage to Natural Philoſophy than to Phyſick, to which the Taſting of Plants is more uſeful.

By the Taſte we diſtinguiſh the Sweets into their ſeveral Claſſes, and we diſcern Tempers and Digeſtion, and Mixture of their Principles, and thence eaſily gueſs at their Effects in Animals; and by the Taſte we diſtinguiſh the different State of both the Oil and Acid in Plants of different ſweet Taſtes; whereas the Chemiſts obſerve no Difference of the Tartar Acid, whether it be Acerb, or Vinous, or Volatile; nor of the ſweet Oils from the bitter and ſlimy.

By the Taſte we diſtinguiſh the *Acrid* and the *Acid* Salts, which mix in Diſtillation; and they are not well diſtinguiſhed by the Chemiſts.

By the Taſte we diſcern when the *Fire* makes new Products and Mixtures, not *naturally* found in Plants; for in Corn, Beans, Peas, Bread, Fire produces a Volatile Salt not obſervable in them before: And a Volatile Salt is drawn from the Lees of Wine by the Fire; and Leaven yields alſo a Volatile Salt; whereas before in Corn only an Oil and Acid were obſerved; and 'tis probable that the Tartar is volatilized both by the Fermentation and the Fire.

Coffee is a Bean by its Taſte and Cods, and acquires a Volatile Salt by roaſting; but *L'Emery* only mentions its Oil and fixed Salt upon Diſtillation; but the fixed Salt is the Effect of Fire, and its Virtue depends on the Volatile.

No more Chemiſtry is neceſſary for the Diſcovery of the phyſical Virtues of Plants, than to make Decoctions of them in fair Water, and to obſerve the Taſte and other ſenſible Qualities of thoſe Decoctions, and from them to take the natural Hints for the Trial of their Virtues on animal Bodies. I will confine myſelf to the *Claſs* of *Sweet Taſtes*, and give an account of ſeveral Decoctions made in all the Species of ſweet Plants, and add ſome Taſtes I had not formerly deſcribed fully, and ſuch Reaſons as induced me to place them in the Claſs of ſweet Plants.

I know it is objected againſt *Decoctions*, that the Volatile Parts expire, and that the Mucilage diſſolving in the Water, obſcures the Taſte: I therefore do confeſs, that Plants are beſt taſted in their natural State to diſcover all their Virtues; but theſe Decoctions do help to confirm our Taſtes, and diſcover the great Variety of Medicines which may be made from ſweet Taſtes. Note, that all Decoctions muſt be taſted cold.

A Deſcription of the Taſtes *and other ſenſible Qualities in the* Decoctions *of* Plants *of* the Sweet Claſs.

1. The *Graſs Sweets*, under which are contained all ſorts of Graſſes and Ruſhes, Reeds and Corn; I refer a *Nymphæa alba* to the Ruſhes, both for its Figure and Taſte, which is crude and ſtyptic, with a Bitteriſhneſs in the Seed; but the Flowers are like Lillies of a ſweet Smell, and mucilaginous, ſweet, ſtyptic in Taſte.

I boiled *Horſe-Tail*, a handful in a Pint of Water, and I found the Decoction to taſte very *ſtyptic* with a Bitteriſhneſs, and the Decoction looked like ſmall Beer, the Taſte being like Ruſhes: I concluded it to be of the ſame Claſs. The ſtyptic Virtue is uſeful for all Fluxes.

Plantago aquatica boiled in Water gave a cauſtic acrid Taſte, joined with a crude ruſh Taſte; the Decoction was greeniſh and pale. This cauſtic Acrimony is uſeful in the Scurvy and Dropſy. It is a *Ranunculus*,

culus, by its *Capitula echinata*, as well as by its Acrimony.

Nymphæa lutea has a ſweet aſtringent Luſtre in the Flowers, with an acrid Smell like Creſſes.

A *Reed* is of a ſweet-bitter and mucilaginous Taſte; it abſterges by the bitter without Acrimony, and cools by the mucilage ſubacrid Styptic, by which 'tis a Ruſh.

Sagittaria is ſweet, ſubacrid, and ſtyptic, by which it is a Ruſh.

Alga Marina is ſubacrid and ſweet, and ſomething ſtyptic.

Fucus is of a ſweet, ſaltiſh Taſte.

The *Palm-tree* is ſweet and ſtyptic; and becauſe of this Taſte, and its *Folia arundinacea*, I refer it to the ſweet Styptic; a ſweet vinous Juice flows from its Bark being wounded: the immature Fruit is very ſtyptic, but the mature ſweet, viſcid, vinous, and ſubaſtringent, proper for Fluxes.

Wine, Vinegar, and Sugar are made from the ſweet Juice.

The inſpiſſate Juice of the Palm-tree is the *Terra Japonica*, whoſe Subſtance is gummoſe, and of a bitteriſh ſtyptic Taſte, and alſo of a ſweet Taſte, and of a grateful Odour. Boil ℥j. of *Terra Japonica* in ℔j. of Water, and ſweeten it for a Cough or Looſeneſs.

Leaven is obſerved by *Ætius* to be cool by its Acidity, to be hot being putrid, and alſo have ſome Virtue from the Salt and Flower. He obſerves that Beer is hotter than Barley, and becauſe of its Putrefaction 'tis of an ill Juice; and he alſo obſerves, its Windineſs depends on the Air included in it; and the wateriſh Beer and the Acid is cooling.

All theſe Virtues were diſcover'd by the ſenſible Qualities of Leaven and Beer, without Chemiſtry. And we may obſerve that what we call Fermentation in them, was called by *Ætius* a Putrefaction. We have rectified the Notion, and given it a new Name; but the Ancients knew the Nature and Effects of Fermentation, as well as the Moderns; and 'tis that which gives the different States of the Principles in Plants, and the ſeveral States are beſt diſcovered by our Taſtes and Senſes.

I boiled *Gramen ſpica ſecalina*, and the Decoction was of a ſweet, mucilaginous, and ſtyptic Taſte.

The *Roots* of *Graſs* have ſomething of Acrimony and Aſtriction, but the Decoction taſtes ſmooth and ſweetiſh. The green Leaves of Graſs are ſweet and ſtyptic. The Decoction of the Water was of a pale Colour.

The *Seeds* of *Graſs* are more diuretic and binding: I made a Decoction of them, which reſembled Water-gruel.

Paronychia foliis rutaceis muſt be referred to the Graſſes, becauſe of its Sweetneſs.

2. *Quære* whether *Ranunculus* be not of the ſweet Claſs, becauſe the whole Plant is ſweet and milky, and for that both are given to Nurſes

to increaſe Milk. The Roots of the *Rampions* are ſomething ſtyptic and cooling, and proper againſt Inflammations.

Scorzonera and *Tragopogon* are referable to the Graſſes, becauſe of their geniculate Stalks, their graſſy Leaves, ſweet Taſtes, and milky Juice; the Decoction was ſmooth, and of a pale Colour.

Trachelium is alſo ſweet, milky, ſubacrid, and bitteriſh, of the ſame Claſs.

3. The *ſweet, mucilaginous* and *crude Lychnis:* the Decoction of *Alſine* is ſweetiſh and mucilaginous, the Colour pale like ſmall Beer. I could obſerve no Aſtringency in *Alſine.* I boiled ℥j. in a Pint of Water; it hath a cooling and moiſtening Quality like common *Lychnis. Dioſcorides* ſays, *Chickweed* being bruiſed has the Smell of a Cucumber.

All the common *Lychnis's* are Bitter-ſweets, and them I ſhall refer to the Claſs of Bitters; though their jointed Stalks and Sweetneſs may juſtly place them here, yet their chief phyſical Virtue is from their Bitterneſs.

4. *The Sweet-bitteriſh Styptic, and Subacrid Fern.*

I boiled ʒj. of *Fern* Roots in ℔j. of Water to half, the Taſte was very ſtyptic and bitteriſh, the Colour Citron.

The Mucilage and Stypticity make *Fern* an excellent Vulnerary, and Styptic in all Fluxes: the young Buds rubbed in the Fingers ſmell ſomething like a Kernel, or the *Laurel* Smell.

Dryopteris is deſcribed aſtringent and ſweet, acid and bitteriſh.

Hemionitis has both Aſtringency and Bitterneſs.

Adianthum album & nigrum are ſweet and ſtyptic; and ſince Experience ſhews theſe to be good Pectorals, the other Ferns have the ſame pectoral Virtue as *Vulneraries.*

Herniaria is deſcribed as a Styptic.

In *Adianthum* there is ſomething odorate. *L'Emery.*

Polypody is bitteriſh, ſweet and aſtringent, nauſeous and ſubacrid and ſlimy; it purges by this Taſte both Choler and Flegm.

I boiled *Harts-Tongue* ℥j. in ℔j. of Water to half; it was of the Colour of ſmall Beer; the Taſte was *mucilaginous, ſweet, ſtyptic,* with an aromatic Flavour of Raſberries or Orris, which is its cordial Virtue, join'd with Stypticity and Mucilage, by which 'tis proper for hot Hypochondriacs.

The Roots of *Oſmunda* are of a ſubacrid and bitteriſh Taſte, beſides the Aſtringency, by which they open, but the Aſtringency much hinders that Effect.

5. The *Sweet, Acrid, Aromatics* and *Fœtids;* the Roots have more Sweetneſs and aromatic Acrimony than the Leaves, which are more crude; the Seeds have moſt aromatic Acrimony.

The Seeds of *Siler montanum* have an ungrateful Smell like Cummin, and a bitteriſh Taſte.

Peucedanum is bitter and ſweet. The green Leaves of *Coriander* are fœtid like *Punaiſes.*

Laſerpitium is acrid, aromatic in Smell, and of a ſweet, acrid, aromatic Taſte.

Samphire is of an acrid, aromatic Taſte; and the Smell of *Smallage.*

Cummin is acrid, aromatic, and bitteriſh, and of a diſagreeable Smell.

Dracunculus Hortenſis is ſweet like Aniſe.

Ferula has an ungrateful aromatic Odour.

The Seed of *Meum* is bitter.

Cachrys is bitter, acrid, aromatic.

Caucalis and *Daucus* agree in Virtue and Taſte.

Saxifraga pratenſis has a great Root, ſweet and acrid; the Leaves are moſt aromatic, and the Seeds; it reſembles the Taſte of Parſly.

The Leaves of *Gingidium* are of a diſagreeable ſtrong Smell, and the Roots bitter.

Tordylium is ſweet, aromatic, *gravi odore.*

Percepier is like Chervil, and ſo is *Pecten Veneris.*

I refer the *Umbells* to the Graſſes, becauſe of their Sweetneſs and jointed Stalks. Our Botaniſts have omitted the ſweet Taſte in ſome of them, which are bitter. Moſt of them are of an aromatic Smell and Taſte, but ſome are fœtid, viroſe, and fervid in their Taſte.

Smyrnium Root has the Smell of Myrrh, with a bitter acrid Taſte; and it helps the Urine, and the Menſes like it.

The Colour of the ſpecifick Juice is various: *Thyſſelinum* and *Seſeli pratenſe* have a Milk: The Ferula's are milky, or have a Saffron Colour: Their Juices make *Sagapenum* and *Galbanum.*

The Juice of the Root of *Peucedanum* is reddiſh, and is called *Opoponax odore piceo vinoſo.*

The Root of *Syphondilium* has a Saffron-coloured Juice, of a fœtid and bitteriſh Taſte.

'Tis obſerved that ſome Seeds grow bitter by the Fault of the Soil in which they grow. All of this Claſs have a volatile Oil and acrid Salt, by which they are diuretic, carminative, and pectoral alſo by their Sweetneſs; Emmenagogue, if fœtid.

I boiled *Parſly* Roots ℥j. in ℔j. of Water to half, the Taſte was ſweet and acrid, aromatic, the Colour pale.

The Roots of *Meum* are acrid, and ſmell ſtrong; too much of it offends the Head.

Libanotis has the Smell and Taſte of the Seed of Angelica.

Sium or *Apium paluſtre fol. oblongis* has an Odour of Bitumen on all the Plant.

Thyſſelinum is Bitter, Ingrate, and Acrid.

The Decoction of *Angelica* Roots is Bitteriſh, Aromatic, Acrid, and of a yellowiſh Colour.

Imperatoria Roots decocted, ſmelled like Angelica, and taſted very bitter and acrid; of a green Colour.

6. *The Sweet, Acrid, Terebinthinate, and Styptic.*

Calamus, *Nardus*, *Cyperus*, agree in their Diuretic, Carminative and Emmenagogue Virtue, and their Stypticity, *&c.*

Calamus reſembles a Reed; it is an *Acorus*, the Taſte reſembles the Turpentine Plants, as well as its Cones.

Juncus odoratus is a Ruſh, with the Smell of a Roſe; when rubbed, of a burning, acrid, aromatic, bitteriſh Taſte.

Cyperus is of a pleaſant Odour, like *Lign. Aloes* whilſt it flowers, and of an acrid, aromatic, bitteriſh, Styptic Taſte.

Nardus reſembles the Flavour of *Cyperus*; 'tis bitteriſh, aſtringent, acrid and aromatic.

The Roots of *Cyperus* are uſed for *Nardus*.

There is ſome Fœtor in *Valerian*, *Aſarum*, *Serpentaria*, whoſe Roots have a little Sweetneſs, with a Terebinthinate Bitter Acrid, and all of them reſemble *Spikenard odoris gravitate*, and have the ſame diuretic, carminative, emmenagogue Virtue, and are proper for Malignant Fevers; and a little Styptic.

The *red Valerian* has a crude Taſte in the Stalks and Leaves, the Flowers rubbed ſmell like Turpentine; the Leaves ſmell nauſeous, fœtid; the Roots agree with Spikenard. *Spica Celtica* and the Flowers of Valerian agree well.

The Leaves of *Wild Valerian* boiled in Water yield a crude and fœtid Mucilage.

The Tincture of the *Roots* of *Valerian*, extracted with Spirit of Wine and Sal Armoniac, fines it much.

The Roots of *Aſarum* are Geniculate as Graſſes, and taſte very acrid, aromatic, and bitteriſh; 'tis called *Sylveſtris Nardus*, and for its Similitude referrible to it. The Ancients attributed the ſame Virtue to *Aſarum* as to *Acorus*, but more intenſe and ſtrong.

Galen obſerved that *Phu* was an Odorate Root, like *Nardus* in Virtue.

Pliny obſerved that *Cyperus* was a *Gladiolus bulboſa radice*, and like the Odour of *Nardus*.

The Decoction of *Aſarum* was greeniſh, with a ſtrong Smell of Spikenard, and bitteriſh Acrid.

The Decoction of *Valerian* Roots of the ſame Taſte, but pale Colour, and Smell of Spikenard, but weaker; they ſeem to be of the ſame Claſs.

7. *The Sweet, Fervid, Acrid, Bitteriſh,* and *Aromatic,* like *Orris* in *Taſte.*

The Roots of *Orris* are geniculate like Graſs.

The *Florentine* Roots are bitteriſh and ſweet, and of a burning Taſte.

The *Water-Flag* is burning and ſtyptic, but of no Smell; the Flowers of common *Orris* have an ill Smell, tho' the Roots be Aromatic. The whole Herb ſmells like Elder whilſt 'tis freſh bruiſed, but when dry 'tis Odorate; it gives a Raſberry Taſte to Drinks, and purges.

The great *Galangal* is aromatic, acrid, burning and bitteriſh; the Roots alſo geniculate, odorate; in Form like *Cyperus*.

The Roots of *Acorus* are geniculate, acrid, burning, bitteriſh and aromatic; it reſembles Orris both in Leaves and Roots.

Ginger is acrid, burning, and aromatic like Pepper; the Leaves are like *Iris Paluſtris*.

Zedoary ſmells like Camphire, and is of a ſtrong Taſte, rather than ſweet, 'tis very bitter, and leſs acrid; but reſembles Ginger.

Coſtus is very burning, acrid, and aromatic, and bitteriſh; it agrees with the Virtue of Orris, both in its diſcuſſing Quality and deobſtructing.

Caſtus dulcis has a ſweet Taſte, and acrid; but the Bitter has an ungrateful kind of Taſte; but there is but one Species of *Caſtus*, the freſh is ſweet and white, the old is bitter and blackiſh.

Gladiolus has a bulboſe Root, ſweet, and moderately acrid or burning; and the Leaves are like Orris.

Xyris is of an ungrateful fœtid Odour, like Climices; in Form and Figure like Orris.

Coſtus Arabicus is acrid, bitter, and aromatic in Taſte.

The Roots of *Contrayerva* ſmell like Fig-leaves, are like Orris-Roots in Figure; they being chewed, taſte ſweet, aromatic and acrid, and have alſo an aſtringent Taſte.

Cardamomum has the Stalk and Leaves of a Reed, the Seeds in Cods of a burning, acrid, bitteriſh, aromatic Taſte.

Amomum by its external Figure and Virtue agrees with *Cardamomum*; ſome reckon it like Acorus.

Grana Paradiſi are of a fœtid and aromatic Taſte, betwixt Cardamums and Pepper, and agree with the ſame in Virtue in Paralytic Caſes.

The Grains of Paradiſe infuſed in Wine give the Odour of Quinces. *Salmon.*

The Roots of our *Yellow Flag* are large and reddiſh; our Countrymen ſcrape them and pound them, then mix them with Milk, and give them twice to a Dog, as an infallible Medicine againſt th Bite of a *Mad Dog*. A Perſon who took them told me they di not purge, but taſted very rough. The Decoction is of a reddiſh Colour, and rough.

8. *The Sweet Mucilaginous Pea-taſtes, or Legumens.*

I boiled *Vicia* ʒj. in ℔j. of Water to ℔ß. which taſted ſweet and crude, ſtyptic; the Colour was pale and greeniſh.

I boiled *Lens Paluſtris* in the ſame manner, and found the Decoction of a turbid Colour, and reddiſh like Mum; it is a Legumen by this intenſe Colour, as well as by the Taſte, which was ſweetiſh, ſubacrid and ſtyptic. Note, that Snails and other Inſects are uſually mix'd with it.

I boiled *Lagopus* in the ſame Quantity as the other; the Taſte of the Decoction was ſtyptic, crude and bituminous.

The *Cortex Lentium* is ſtyptic and binding; the Seed of it mucilaginous and looſening; and this breeds an ill, flatulent and crude Juice, obſtructing the Circulation of the Blood and Spirits, injurious to the Sight and Menſes; and by their Flatulency producing turbulent Dreams.

The Leaves of *Liquorice* feel gummoſe, the Roots are ſweet and ſubacerb.

Tamarinds are of an acid, acrid and ſweet mucilaginous Taſte; the Stones have the Figure of *Lupins*; the Leaves of *Tamarinds* are of an acid agreeable Taſte; and they muſt be referred to the *Services* and *Berberries*, tho' by the Cods and Seeds I erroneouſly have claſs'd them with *Caſſia* or *Lupins*.

Fumitory is ſubacrid, bitteriſh, mucilaginous, and leguminous, tho' the Flowers be not.

Radix Cava has bitter-ſweet Roots like Beans, and a mealy ſubacrid Taſte; the Leaves have a crude Smell like Fumitory, and of the ſame Virtue.

The *Skin* of the *Bean* is ſtyptic, but the bitteriſh Part leguminous.

Coffee is bitteriſh and of the Bean kind, in which there is a Volatile Salt, which raiſes the Spirits, and produces the Urine and the Menſes.

Orobus is of an ungrateful bitteriſh Taſte; all the bitter Legumens open Obſtructions and promote Urine, as Kidney-Beans, *&c.*

I boiled *Broom* ℥j. in Water ℔j. to ℔ß. the Taſte was moderately bitter, ſweet, and ſtyptic, not nauſeous, and without any Heat.

I boiled of *Geniſta Spinoſa* Roots ℥j. in ℔j. of Water to ℔ß. the Colour was like ſmall Beer, the Taſte mucilaginous, ſtyptic; it may be proper for the Stone by thoſe Taſtes, and for Fluxes.

The Leaves of *Bruſcus* have the Smell of Broom when bruiſed, and its Bitteriſhneſs, and Stypticity and Sweetneſs, and are ſubacrid; and by this Taſte a Legumen.

Crato deſcribes *Senna* as if it had *Viſcidum quid*, by which it gripes; and by the Taſte he diſcovered the Bitteriſhneſs and Aſtriction. *Matthiolus* obſerved its viſcous Taſte and Bitteriſhneſs, with a viroſe nauſeous Odour, like *Cynogloſſum* or *Punica*. The Siliquæ, as well as the ſweet Taſte and Flowers, prove it a Legumen.

Polygala boiled with the blue Flowers gave a Colour blue like Violets, and the Taſte was very mucilaginous; the Plant is aromatic, acrid.

℥j. of *Viola Tricolor*. boiled in ℔j. of Water to half, made a Decoction of a greeniſh Colour, like Cowſlip Wine, and it taſted gratefully and mucilaginous; the Roots of *Polygala* are acrid and aromatic; it purges Bile.

The Decoction of the Root of *Periclymenum* is ſtyptic and bitter, and of a ſweet leguminous Taſte.

Purple *Trefoil* is mucilaginous and ſtyptic, by which it cools feveriſh Heats, and by its burning Acrimony it expels the putrid Particles in *Petechial* Fevers and Fluxes.

The Leaves of red *Trefoil* rubbed ſmell acid, and the Flowers rubbed ſmell like Woodbind. The Decoction of ℥j. in ℔j. of Water to half, gave a greeniſh Colour, pale; and the Taſte was of a crude mucilaginous leguminous Taſte, with an Acrimony, by which 'tis a great Diuretic and Opthalmic.

The Decoction of Purple *Trefoil* has a turbid Colour, and mucilaginous Taſte.

The Leaves of *Periclymenum* are acid and acrid; the Flowers more ſweet, and the Style is of a Bean Taſte, and the Twigs of the ſame.

The *Stamina* have the Taſte of the Flower, and their Heads are very acrid.

Trifolium Fruticans is Bacciferous, with a blue Juice; and tho' it wants Cods, 'tis a Legumen, as well as Periclymenum, which is bacciferous.

The Flowers of *Aſparagus* are *Hexapetali*, and of an herbaceous Colour; the Seed is a Pea, without a Cod, the Root is of a ſweet glutinous acrid Taſte; the Tops of it boiled reſemble Peas-Pottage, and are evidently of a leguminous Taſte.

In the *Legumens* theſe are irregular, in Flowers or Cods, they are notwithſtanding certainly of that Claſs; by which we may infer, that the Taſte give the moſt certain Character of a Claſs.

The *Herba Mimoſa* has an herbaceous Odour, and a mucilaginous bitteriſh ungrateful Taſte; the Root is of a Taſte more grateful, without Bitteriſhneſs, but of a violent Smell like Garlick when firſt got, offending the Smell and Head, and is accounted a Poiſon. *Moriſon.*

Meſue obſerves that *Pſyllium* has contrary Virtues: 'tis of a mucilaginous, acrid and nauſeous Taſte: The *Medulla* is hot and exulcerating; the *Cortex* moiſtening and cooling.

Goſſipium is a Plant like Linum, both in Leaves, Flower and Stalk.

There is a Bitterneſs in *Linaria*. *Moriſon.* *Linaria* is by its Flower of the leguminous Claſs, and probably *Linum* is of the ſame, tho' the Flowers diſagree, being like it in Leaves.

Linſeed has the ſame Virtue as Fenugreek, which is a Legumen. The Leaves of Flax are gummoſe and bitteriſh, ſubacrid; the Flowers are *Pentapetali*, which differ from the Legumens.

I boiled ℥j. of *Galega* in ℔j. of Water to the half; the Colour was pale, and the Taſte nauſeous, bitter, ſweet and mucilaginous, and the Odour nauſeous and fœtid.

The freſh Leaves of *Trifolium Aſphaltites* ſmell like Rue; when ripe, like Bitumen.

The Decoction of *Ononis* was mucilaginous, ſubacrid, the Colour was greeniſh.

The Leaves of *Conſolida Regalis* are of a crude Smell, the Seeds are in Cods, and taſte leguminous. The whole Plant is of a diſagreeable Taſte.

Glaſtum and *Ophiogloſſum* are of the ſame Virtue, and *Luteola* is like them; place them here, or with the Creſſes.

Thalictrum muſt be referred to the Docks both by its Taſte and Virtue.

Lignum Nephriticum is ſubacrid and bitteriſh.

The Manner of making Styrax Liquida. *Communicated by Mr.* J. Petiver. *n.* 313. *p.* 44.

VI. *Roſa Mallas* grows upon the Iſland *Cobroſi*, at the upper End of the *Red-Sea*, near *Cadeſs*, which is three Days Journey from *Suez:* It is the Bark of a Tree (taken off every Year, and grows again) boil'd in Salt-Water 'till it comes to a Conſiſtence like Bird-lime, then ſeparated, and put into a Caſk and brought to *Judda*, and ſo to *Mocha* in *June* and *July*, where it ſells from 60 to 120 Dollars *per* Barrel, according to its Goodneſs. The beſt is what is freeſt from Clay and Dirt, which is commonly mix'd with it; And the way to try it is, to waſh it in Salt-Water, which will cleanſe it. The *Arabs* and *Turks* call it *Cotter Mija*. A Barrel is 420℔.

Of the Indian Varniſh; *by Dr.* J. del Papa. *Communicated by Dr.* Sherard. *n.* 274. *p.* 947.

VII. The uſing and handling of the *Indian* Varniſh (or *Lacker*) ſo far as is neceſſary to apply or lay it on Subjects to be varniſh'd, having produced ſuch extraordinary Effects on Signior *Ignatio*, and more remarkably on his Maid-Servant, *viz.* in great Swellings of their Heads and Eyes, and in their Arms, and indeed almoſt their whole Body, with an intolerable Itching and Inflammation, or Heat in Pimples; is ſo new and extraordinary a Phænomenon in Nature, as preſſes us to ſearch the Reaſon: and the rather, for that amongſt the numerous Ingredients of the *Materia Medica*, and all other natural Subſtances known to us, there is not one that produces equal, or the like Alteration to what this does in Human Bodies. All our Liquors and corroſive Spirits hurt only the Parts of the Body that they immediately uch, and diffuſe not their miſchievous Quality over the whole Body, as this *Varniſh* does, and the Hurt cauſed by them is very different. Poiſonous Fumes or Steams from *Mercury* or *Antimony* manifeſt their Malignity on the *Brain* and *Nerves* with great and incurable Evils: Whereas the Effluvium and Touch of this Varniſh offends only the exernal Skin of the whole Body, indeed after a very ſtrange manner, ut yet not deſtructive to the Part affected, which grows well again of itſelf. There are indeed ſome Juices of Roots and Herbs, and other Parts of Vegetables, which touching our Fleſh, ſome inflame it, ſome exulcerate it, ſome produce Swellings, Puſtules, and Itching; but all theſe produce the Evil only where they touch, and ſpread not their inviſible Venom over other Parts of the Body. I know not the Example of one thing, which either only touch'd with the Hand, or inſinuating itſelf by its Fume or Vapour into our Body, is able to produce over almoſt all the Skin of the Body, Inflammations, Swellings, Itching and Puſtules, as if the whole Body were ſtung with an infinite Number of *Waſps* or *Gad-bees*; for ſuch exactly are the Effects cauſed by this Varniſh.

This great Difference between this and all things elſe that we know, and the Ingredients of which it is made, being abſolutely unknown, renders it impoſſible to penetrate the Cauſe of the above-named Effects. Yet whoever would propoſe ſome probable Thought, may ſay that this Varniſh contains ſome Matter, which when hot ſends into our Body a very ſubtile thin Vapour, which affects only the Skin, leaving the other Parts of the Body untouch'd; after the ſame manner, *Cantharides*, not only taken inwardly, but alſo outwardly applied to our Bodies, communicates a venomous Quality of a particular Nature, affecting only the Kidneys, Bladder, and Urinary Paſſages, cauſing there ſenſible Pains and Excoriations, not in the leaſt touching the other *Viſcera.* Some Phyſicians are of Opinion, that this particular Diſagreement of Cantharides with the Urinary Ducts, comes from the Salt and Nitre contained in the Urine, which gives Life and Vigour to the Poiſon of the Cantharides, without which Salt the poiſonous Quality of the Cantharides could have no Power. So after the ſame manner it may be ſaid that the noxious Fumes of the *Varniſh* become hurtful to the Skin, becauſe it mixes there with ſome Juice it meets with in the Skin itſelf, eſpecially in the *Miliary* Glands, whereof the whole Skin is full. This Thought is but an Imagination; but in Matters of this Difficulty we may well bring only probable and likely Arguments. This is certain, that this Varniſh exerts all its Malignity againſt the Skin, the *Viſcera* and Blood being untouch'd; beſides, I obſerv'd that the Maid (at the ſame time that her whole Skin almoſt was hard, inflamed, ſwell'd, and full of Puſtules) had yet no Fever, no Pain in the Head, nor any inward Sickneſs or Illneſs; and as to what Diſorders ſhe or Signior *Ignatio* felt in their Eyes, this likewiſe was only a Swelling affecting the Eye-lids only, which may be reckon'd but as Skins: But 'tis poſſible the ill Effects of the Varniſh were more ſenſible and troubleſome in that Part becauſe the Skin there is thinner and more delicate than on the reſt of tl Body. This Varniſh therefore is only an Enemy to the Skin; anc that this Miſchief ſhould attend it, it is not neceſſary that the Varniſl ſhould be heated; for although it is cold, it ſends forth the ill Steam, which inſinuates itſelf into the Body, eſpecially when touched anc handled.

I have ſeveral times ſpread a great deal of this Varniſh hot upon the naked Skin of *Poultry*, and they never received any Miſchief from it, either internal or external. I have cauſed other Fowl to ſwallow Crumbs of Bread ſopp'd in the Varniſh, and they ſeemed to like it very well. In others I have made ſeveral little Pricks in their Breaſts till the Blood came out, and then anointed it all other with Varniſh, which, inſtead of hurting them, proved a Balſam to heal them. It is poſſible, this Varniſh, on the very thin Skin of Fowl, does not produce the ſame Effects as on that of Men, becauſe they are very different from one another, in their Structure and Quality of the Humours contained in them. And to ſay ſomething of its Subſtance; I have obſerved that this Varniſh is in a great part compoſed of *Gummy* and *Unctuous* Matter; and ſince it is very light, ſwimming upon Brandy and Oil, and unites neither with Water nor Spirit of Wine, nor any other Liquor, but only with Oil, and burns or takes fire; for I have dipp'd Cotton in it, which has burnt all away to Aſhes, though at firſt there was ſome difficulty to make it take fire; perhaps ſome other Matter not unctuous being mixed with it: and laſtly, ſince, being obſerved with the Microſcope, its Compoſition ſhews like that of Oil or Lard, or the like unctuous Matter; it is very likely from all theſe, that it is compoſed of the Gum or Juice of ſome reſinous Herb or Tree, or of the Fat of ſome Animal, or Hog's Lard. And perhaps the Gall of ſome Creature may be mix'd with it, to make it the more eaſily receive a Smoothneſs and Luſtre, as Limners uſe to put *Gall* into their Water Colours, to make them run and ſpread the better; and that the Miſchief we find in touching and uſing it may proceed from hence.

I believe there is no Mercury, of what ſort ſoever, in this Varniſh; not only becauſe it is very light, but becauſe I have been very diligent in trying whether Gold would diſcover any Sign of Mercury, either in the Body of it, or the Smoke, but could never find any; and moreover, Mercury produces very different Effects in our Bodies, from thoſe of this Varniſh.

Beſides, I have obſerved that the Varniſh mix'd with Spirit of *Vitriol*, or Juice of *Lemons* or *Vinegar*, or Spirit of *Wine*, makes no Ebullition nor Change of Colour; but it readily changes Colour, when taken out of the Veſſel and expoſed to the Air, becoming at firſt reddiſh, and afterwards almoſt quite black; the outward Skin of it, which is next to the Air, becoming very hard and black. This Skin is very thin, under which the reſt of the Varniſh remains ſoft and fluid, of the Colour and Conſiſtence of Honey; and as often as you take off this outward black hard Skin, there will another be formed immediately like the former, and this as often as you pleaſe to repeat the Experiment. So that the whole Subſtance of the Varniſh will in time be changed into theſe hard and black Skins.

It is worth obſerving, that this Varniſh has this known Power; for having ſpread ſome of it on the naked Breaſts of ſome Fowls, leaving it ſticking there three Days, I afterwards found between the dried Varniſh and the Fleſh, the Place all feſter'd, and full of a yellowiſh *Serum* or Matter, but without any farther Miſchief to the Bodies of the Fowls themſelves. I have attempted the ſame thing on Dogs and Cats, but without Succeſs; for theſe Animals with their Tongues and Claws ſoon take off all the Varniſh from their Bodies, and ſo receive no Hurt by it. Perhaps in Horſes, and ſuch like Beaſts, the Experiment might ſucceed better, if the Varniſh has this corroſive or cauſtick Quality on their Bodies that it has on Poultry.

Of Cobalt, *and the Preparation of* Smalt *and* Arſenick; *by Dr.* D. Kreig. *n.*293.*p.*1754.

VIII. *Smalt* is made of *Cobalt* or *Cadmia Nativa.* The *Cadmia* is a maſſy, grey, ſhining Stone, found in a great Quantity in the Mines about *Shneebergh*, and ſome other Places in *Hermanduria.* It is very often mix'd with *Marchaſite*, ſometimes with *Silver* and *Copper* Ore; nay, the Silver is ſometimes (tho' but ſeldom) pure in the Figure of Hair.

After they have pick'd out the Cobalt, and ſeparated it from the common Stone, they beat it to Powder by an Engine or Machine, commonly uſed in Mines, call'd a Pool-work. By that Operation the Water carries away the light Stuff and Sand, leaving the heavieſt behind. This Powder is afterwards put into a low and broad Furnace, made on purpoſe to ſeparate the Sulphur and Arſenick; where the Powder is ſpread all over, and the Fire which is beneath and behind it, is forced to paſs its Flame along over the Powder, and ſo to take along with it the Arſenick in form of a Smoke, which afterwards is received by a low Chimney, and out of that carried in a cloſe Channel made of Brick-Wall, of about fifty or more Paces, where the Arſenick by the way ſticks to the Wall, in form of a white or yellowiſh Powder. The ſame is taken out every ſix Months, and melted into whole Pieces.

The *Cobalt* thus roaſted, and ſmoaking little more, being red-hot, is taken out and cooled again, and gathered for melting. Its *Colour* by that way of Roaſting is turned a little more whitiſh.

When they have a mind to melt it, the Powder of the Cobalt is mixed with Pot-Aſhes and Powder of white Flint Stones. The Proportion of them is according to the Goodneſs of the *Cobalt*, or as they will make the *Smalt* of a deep or paler Colour: For Example; they take one Part of Pot-Aſhes, two Parts of *Cobalt*, and three or four Parts of Flint. This Mixture is put into great ſtrong Pots, ſtanding in a hot Furnace; ſix or eight Pots in one Furnace; there it ſtands melting for five or ſix Hours time, turning into a blue Glaſs, which afterwards is taken out with a great Iron Spoon, and put into a Veſſel full of cold Water, where it cracketh and grows more tender, to be the more eaſily powdered again: but the empty Pot in the Furnace is filled up again with the aforeſaid Mixture. And ſo they continue Night and Day, not leaving off the Fire in the Furnace.

The blue Glaſs taken out of the Water is powdered again by the ordinary Engine; the fineſt ſeparated by a Sieve, is put into a Mill, and grinded in Water unto the fineſt Powder, which by waſhing is ſtill ſeparated from the coarſer. It is afterwards dried in little warm Chambers, put into Barrels, and thus ſent away to ſeveral Countries.

If one of the Melting-Pots breaks, or is very much burnt, ſo that it muſt be taken out, there they find always on the Bottom two Cakes of different Stuff, not mixed with one another. The undermoſt is a ſort of *Æs Caldarium* of *(Gleiken Spiſſe)* and the uppermoſt is of *Marchaſite.*

The Graſs and Fruits growing thereabout, where ſuch a Workhouſe ſtands, are commonly poiſoned by the Arſenical Smoak, that no Cattle or Men can, without Damage, feed upon them.

Fig. 188, 189. The *Furnace* where the *Cobalt* is roaſted, and the *Arſenick* ſeparated. *a*, The *Furnace* to roaſt the powdered *Cobalt*. *b*, The *Chimney* accepting the arſenical Smoak. *c*, *c*, *c*, The Channel of Stones to collect the Arſenick. Fig. 188, 189.

Fig. 190. The *Furnace* for melting the *Cobalt* into a *Glaſs*, *a*, *a*, *a*, *a*, the Holes where ſtand the *Melting-Pots*. The great *Holes*, where they put in the Pots are ſhut up with Bricks, and little ones are left, where they take out the Glaſs with the Spoon, *b*, *b*, *b*, *b*. Fig. 190.

Fig. 191. Two *Grinding-Stones* to grind in Water. Fig. 191.

IX. I have obſerved that the *Mixture* of the greateſt Part of the Salts in many Liquors is accompanied with a ſenſible *Coldneſs* of the Liquors, notwithſtanding the prompt and violent *Fermentations*, which follow many of theſe Mixtures.

Obſervations on the Diſſolutions, and Fermentations, *which we may call Cold. By Monſ.* Geoffroy. n. 274. p. 951.

I have diſtinguiſhed theſe Diſſolutions or Mixtures into two Claſſes. In the former I comprehend all the ſimple cold Diſſolutions, that is to ſay, thoſe Diſſolutions which are not accompanied with any ſenſible Ferment. The ſecond takes in only the cold Ferments, or Diſſolutions of Salts, which are accompanied with a ſenſible Ferment, and a Coldneſs of the Liquor.

Claſs I. *Of Simple Cold Diſſolutions.* I put a Pint of common Water into a Viol, and an ordinary Thermometer of eighteen Inches in the Water, and ſo let it lie ſome Time to fit itſelf in proportion to the Temperature of the Water. I afterwards put into the Water four Ounces *Sal Armoniac*, and the Liquor of the Thermometer deſcended two ches and nine Lines, in leſs than a Quarter of an Hour.

Diſſolution of Salts *ſalted in common* Water.

Obſerving the ſame Circumſtances, I made the ſame Experiment with Salt-Petre, and the Liquor of the Thermometer deſcended one Inch and three Lines.

The ſame Experiment being made with Vitriol, the Liquor of the hermometer deſcended almoſt an Inch.

Sea-Salt made the Liquor deſcend but two Lines. And all the Salts being to be put in very lightly, I thought it the hardeſt Matter to pour it in aright.

Diſſolution of Alkali Volatile *ſalted in common* Water.

All the *Alkali Volatile* Salts cooled the common Water by their Mixture, cauſing the Liquor of the Thermometer to deſcend by ſome Lines: But I obſerved that they cauſed (to do ſo) more or leſs, according as they were more or leſs purified: And the Salt of Urine ſeem'd to do ſo ſooneſt of all.

Alkalious Lixivious *Salts* excepted *from the general Rule, becauſe that ſome of them do* heat *in their mixture with Water.*

As to the *Alkali Lixivious* Salts, they were ſo far from cooling the Water in which they were mingled, that they heated it more or leſs, according as they were calcined better or worſe.

Upon the whole, one may obſerve that the Salts for heating the Water ought to be purely alkalious. For if they approach near the Nature of Nitre or Sea-Salt, they heat the Water but little or not at all, if they do not rather cool it. This is alſo to be done very conſiderably by the Salt of *Tamariſc*, extracted from the *Lixivium* of the Aſhes of this Vegetable.

Salts *ſalted mixed with the* Acids *of* Vegetables.

Sal Armoniac mingled with the Acids of Vegetables, as diſtilled Vinegar, Juice of Lemons or Verjuice, gave no Mark of a Ferment, but cooled theſe Liquors very much.

An Ounce of *Sal Armoniac* caſt into four or five Ounces of diſtill'd Vinegar, cauſes the Liquor of the Thermometer to deſcend two Inches three Lines.

The ſame Salt, mixed with the Juice of Lemons, cauſed the Liquor to deſcend two Inches. It does the ſame with Verjuice.

Theſe are the Mixtures of Salts with Liquors, which ſeem'd moſt remarkable, by reaſon of the *Cold* which they excited.

Salts *ſalted, mixt with* Acid Spirit.

Claſs II. *Of cold Fermentations.* Salt-Petre, caſt into its acid Spirit, raiſed ſome Smoke or Vapours, and cauſed the Liquor of the Thermometer to deſcend four Lines.

Salt-Petre, mixed with the Spirit of Vitriol, Smoke exhaled in great Quantity, and cauſed the Liquor to deſcend from ſix to ſeven Lines. In theſe two Experiments I put half an Ounce of Salt upon three Ounces of Liquor.

I put half an Ounce of *Sal Armoniac* into three Ounces of Spirit of Nitre, and the Liquor of the Thermometer deſcended three Inches five Lines. This Mixture put forth ſome Vapours, which ſeemed more conſiderable than thoſe which do ordinarily exhale from Spirit of Nitre alone.

I poured half an Ounce of *Sal Armoniac* into three Ounces of Spirit of Vitriol, which made a violent Fermentation. The Subject Matter was conſiderably raiſed, and much Vapour went out, the Liquor was very thick, and the Thermometer deſcended three Inches ſix Lines. I obſerved, that the Vapours which were raiſed by this Mixture were hot, and that they conſiderably raiſed the Liquor of the Thermometer,

Fig.

Fig.

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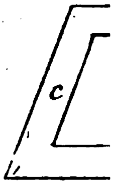

meter, which I held hanging above the Subject Matter, tho' that which was dipped within did deſcend, and ſhew'd a very great Cold.

Sea-Salt *excepted.*

Sea-Salt mixed with acid Spirits, heats the Liquors, inſtead of cooling them. Being mixed with Spirit of Salt, it raiſed the Liquor of the Thermometer ſome Lines, without ſhewing any ſenſible Ferment. With Oil of Vitriol it ferments with a Noiſe, and raiſes a great Smoke: The Liquor thickens, and becomes a Sort of a clear Jelly. The Liquor of the Thermometer riſes very much in this Mixture, and the Heat is ſenſible to the Touch.

Volatile Alkalious *Salts, mingled with acid Spirits.*

All the Volatile Alkalious Salts mingled with different acid Liquors, excited a Ferment more or leſs ſtrong, according to the Acidity of the Liquors, and the Purification of theſe Salts from their fœtid Oils. They all made the Liquor of the Thermometer to deſcend: But that which did ſo the moſt conſiderably, is the Salt of Urine.

One Ounce of Volatile Salt of Urine very well rectified, in four Ounces of diſtilled Vinegar, made a ſtrong Fermentation. The Subſtance is elevated very much, and with Noiſe; and the Liquor of the Thermometer deſcends in the Ferment one Inch nine Lines.

One Ounce of Volatile Salt of Urine, in three Ounces of Spirit of Vitriol, raiſed a violent Ferment, during which the Liquor of the Thermometer deſcended two Inches four Lines.

Fixed *Salts purely* Acid *excepted.*

The Mixture of Salt of Tartar, or other fix'd Alcalious pure Salts, with acid Liquors, excited Fermentations with Heat.

I made all theſe Experiments with the ſame Thermometer, when the Weather was ſufficiently cold, and the Temperature of the Air equal enough.

Reaſon *of the Cold, and Diſſolution of* Salts.

As to the Reaſon of theſe Experiments, I firſt of all examined the ſimple cold Diſſolutions, and having (with all Phyſicians) fixed this Principle, That Cold is nothing but the Diminution of Motion; I ſay, that the Coldneſs which the Salts bring to the Water, ſeems to be occaſion'd from this, that the ſalt Particles being without Motion, and dividing that Liquor, diminiſhes it ſo much the more. This (is that) which produces the Cold greater or leſs in the ſame Liquor.

Why the Thermometer *riſes a little, the* Diſſolution *being* made.

There is one thing to be obſerved; which is, that ſome time after the Diſſolution is made, the Liquor of the Thermometer riſes again a little; which may be occaſioned by this, that the ſubtile Matter which glided abundantly between the Liquid Particles, had ceaſed to glide there in the ſame Quantity for ſome Time, the groſs Particles of the Salts oppoſing themſelves againſt their Paſſage; but theſe Saline Particles being divided by little and little, they opened again the Paſſages to the ſubtile Matter. This gave to the Liquor more Motion than it had at the Beginnig of the Diſſolution; but yet leſs than it d when it was pure and without Mixture; the Saline Particles, altho' diſſolved, abating ſomewhat of their Motion.

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Whence proceeds the Heat *of the* Diſſolutions *of* Lixivious *Salts.*

We may eaſily comprehend why lixivious Salts, purely alkalious and well calcin'd, as alſo the Salt of Tartar, do heat the Liquor, and are very far from cooling it, if we conſider that theſe Salts in the ſtrong Calcination which they have undergone, are loaded with many fiery Particles which they hold, as it were in Priſon, in their Pores. Theſe igneous Particles regain their Liberty by the Diſſolution of the ſaline Particles. And in the ſame time that theſe Salts ought to ſlacken the Motion of the aqueous Particles, and cool it, the igneous Particles being very active, do augment the Agitation of the watry Particles, till they make it very hot.

Great Coldneſs of Sal Armoniac *even to* Freezing.

I obſerve next, that *Sal Armoniac* cools the Water wherein it is diſſolved, more than any other Salt. Its Cold equals that of Water which is ready to freeze. And it happened one time, that in diſſolving a good Quantity of this Salt, in Water, ſome Drops which fell on the outſide of the Viol, in which I made the Diſſolution, did freeze; and the Straw upon which the Viol ſtood, being wet, was faſtned to the Glaſs-Veſſel, for ſome time, by the Ice. This fell out ſince the Summer, at a time when the Weather was warm. I have many times ſince tried the ſame Experiment, in different Ways, but without ever being able to produce the Ice. Chance had apparently made me meet with in this Experiment, not only a very exact Proportion between the Salt and the Water, but alſo a Temperature in the Water beſides, which I ſuppoſe neceſſary: Becauſe the Diſſolution being quick, the Coldneſs muſt alſo be more ſudden and great: And this is that Degree of Temperature to which I could never afterwards attain.

Reaſon *of the* Coldneſs.

The great Coldneſs of the Diſſolution of *Sal Armoniac* proceeds not from any Difficulty which it has to be diſſolved, ſince it diſſolves ſooner than any other. And Sea-Salt, whoſe Diſſolution is different and very ſlow, is that which does leaſt cool its Diſſolver. On the contrary, it ſeems that the Facility and Readineſs with which it diſſolves, may be the Cauſe of this greal Cold, in this manner.

Sal Armoniac is a Compoſition of Sea-Salt, and Salt of Urine, the one very eaſy, the other very hard to diſſolve; the Particles of Sea-Salt being, as it were, impriſoned among the Particles of the Salt of Urine, it comes to paſs, that many of the aqueous Particles, penetrating at firſt daſh the ſaline Particles of the Urine, do there immediately loſe much of their Motion; and this Motion grows weaker by ſo much the more, as the aqueous Particles meet afterwards with ſaline Particles of another Nature, whoſe Reſiſtance is much more conſiderable, than that of the Salts of Urine. So that in the firſt Inſtance of the Diſſolution, the Motion of a great Quantity of aqueous Particles being very much abated all at once by the Salts of Urine, and by the Sea-Salt, it excited in a few Moments, a Cold far greater than the Cold of other Diſſolutions of Salts, which the Water does not penetrate ſo readily.

It may be objected, that the Sea-Salt being the hardeſt to diſſolve, its Diſſolution would be alſo the coldeſt. To which I anſwer, that this might be, if the Water could penetrate ſuddenly into all its Parts: But the Slowneſs with which it penetrates them, becauſe of the cloſe Texture of the *Molecules* of this Salt, does hinder that the Diminution of the Motion of the Parts of the Water, can't be ſo ready, nor by conſequence ſo great: Whereas in *Sal Armoniac*, the Parts of the Sea-Salt being extended by the Salt of Urine, the Pores of the Alkalious Salt of Urine are like ſo many Ways open to the Parts of the Water, for going to penetrate the Parts of the Sea-Salt in numberleſs Places.

Experiment of a Saline *Diſſolution* exceſſively *Cold.*

I place in the Rank of Cold Diſſolutions, an Experiment which Monſieur *Homberg* made ſome time ago, before the Society. Take a Pound of corroſive Sublimate, a Pound of *Sal Armoniac*, powder them, each apart; then mix both the Powders very exactly; put the Mixture into a Vial, pouring upon it a Pint and a half of diſtilled Vinegar, ſhaking it well together. This Compoſition will be ſo very cold, that a Man can hardly hold the Veſſel in his Hands in Summer. And it happen'd that, as Monſieur *Homberg* was making this Mixture, the Subject froze.

We ſee, in this Experiment, a Cold yet greater than that in the Diſſolution of *Sal Armoniac* alone in common Water. And this Cold is cauſed by the corroſive Sublimate, which alone is not at all, or at leaſt very little diſſoluble in diſtilled Vinegar. So that the fluid Parts of the diſtilled Vinegar having quickly penetrated the Parts of the *Sal Armoniac*, and having already loſt a great deal of their Motion, engaging afterwards in the Pores of a Body which they could not diſſolve, and having Action not more than enough for that, they do there loſe that little Activity which they had. They coagulate there, if not all, at leaſt the greateſt Part: And this Want of Action is the Cauſe of that great Cold which we perceive there.

Explications of Cold Ferments.

In order to ſhew the Reaſon of *Cold Ferments*, I own (with the Phyſicians) that Heat and Cold in Liquors are neither more nor leſs than Motion in the little Parts of theſe Liquors, cauſed by the continual Current of the ſubtile Matter in the Spaces which theſe Particles do leave between them. And I affirm, that every time this Motion is diminiſhed, and when the Courſe of the ſubtile Matter is interrupted, the Liquor appears leſs hot, or more cold.

This being ſuppoſed, if we do attend to that which happens in cold Fermentations, we ſhall obſerve on the one hand, for the moſt part, very conſiderable Coagulations, and a very ſenſible thickening of the Liquors: On the other hand, we ſhall perceive a very violent Agitation of ſome of the Parts of theſe Mixtures; many Vapours are exhaled, the Matter ſwells, ſends out many Bubbles, and ferments with Noiſe. And in this manner I conceive that all theſe Effects are produced.

In the Mixture which I made of Salts with Acid Liquors, the greateſt part of the Liquor coagulating with a part of the Salts, its Motion was much abated in a little time; but its Parts not being able to coagulate, without ſtopping or weakening the Current of the ſubtile Matter; this Matter finding the Paſſages ſhut up, takes its Courſe by the Interſtices, which remained between the coagulated Particles, where the Paſſage was yet free; and as it glided away in a Quantity together, it cauſed a very conſiderable Agitation in the Parts which it met with in its Paſſage. 'Tis this Agitation which cauſes the Fermentation which we perceive: 'Tis this which raiſes the Bubbles of Air and the Smoke: 'Tis this which puffs up and ſwells the Matter with ſo much the more Violence, as all the Parts of the Liquor being almoſt half coagulated, do hinder the Motion and Agitation of theſe little Particles. Nevertheleſs this Agitation, how violent ſoever it may appear, is not conſiderable enough to break the Coagulum intirely, which is formed in the Liquor, nor conſequently to overcome the Cold, which cauſes this Coagulation. All it can do, is to preſerve yet ſome kind of Fluidity. In ſhort, the more theſe Mixtures are diſpoſed to coagulate, the more they excite the Cold. This we may ſee in the Mixture of the *Sal Armoniac* with the Oil of *Vitriol*, in which the Coagulum becomes ſo ſtrong, that at laſt it forms above the Liquor a very thick Saline Cruſt. In the Mixture of other Salts with weaker Acids, as in the Mixture of volatile Salts with Spirit of Vinegar, the Coagulum can hardly be perceived; nor is the Cold ſo conſiderable as in the former. I add farther, That even the violent Agitation which this Mixture cauſes, being not univerſal, and paſſing no farther than ſome few Places of the Liquor; it may for all that, contribute to the great Coldneſs in the Mixture of the *Sal Armoniac* and Oil of *Vitriol*, in increaſing the Coagulum, ſo that the little Particles which are violently agitated in this Mixture, being not able to draw along with them, in their Motion, the coagulated Parts which are too groſs, they drive them away from the Centre of their Motion: So that theſe Particles almoſt half coagulated, being got amongſt theſe little Whirl-pools, and preſs'd one againſt another, they ſtick cloſe to one another, coagulate more ſtrongly, and loſe their Motion intirely; which cauſes a very great Cold. If any Man can ſcarce perſuade himſelf that the violent Agitation in ſome Parts of the Mixture does contribute to the Coldneſs of the Liquor, he may be convinced by the following Experiment.

Experiment of Water cooled *by* Fire.

I put ſome cold Water into a great Baſin; I put into the middle of the Water a Cucurbit of Glaſs full of Water equally cold; I put into the Cucurbit a very good Thermometer, which I let lie a good while for a Trial. When it was adjuſted to a degree proportionable to the Cold of the Water, I threw ſuddenly into the Water in the Baſin 4 or 5 Shovels full of Coals well kindled; and in an inſtant, the Liquor of the Thermometer deſcended 2 or 3 Lines. After ſome moments, the

Liquor roſe again, when the Heat of the Water in the Baſin was communicated to the Veſſel of Glaſs.

Reaſon of this Experiment.

The Cold of the Water of the Cucurbit, can't be attributed to any thing beſides the Preſſion or ſudden Condenſation which the Fire cauſed in the Water, wherein it was put. Which Condenſation may be explained in this manner.

In the inſtant that the burning Coals were thrown into the Water, the Vortex of the ſubtile Matter by which it was turn'd round, being preſs'd by the Water which environ'd it, ſcatter'd with Violence all the Particles of the Water. This ſcattering being made all at a time in many places of the Water in the Baſin all round the Veſſel of Glaſs, all the Particles which environ'd the Veſſel, being at once preſs'd on all ſides, were condenſed conſiderably and ſucceſſively. The Veſſel being in the Centre of Preſſion, bore all the Weight of this Preſſion, as well as the Liquor which contained it. And this Liquor loſt by its Condenſation very much of the Motion of the Liquid, which it had before, which was conſiderable enough to cauſe the Liquor of the Thermometer to fall. This Cold goes off quickly, becauſe all the Water in the Baſin being very much heated, it quickly heats alſo that in the Veſſel of Glaſs.

The ordinary Thermometers not being capable of marking to me the Cold of the Water ſo readily and nicely as I would, in this Experiment, I had Recourſe to another ſort of Thermometer † which was more exact.

† Vid. *Supra* Vol. iv. Part ii. p. 10.

Reaſons *of the* Hot Vapours *from the* Cold Ferment *cauſ'd by the Mixture of* Sal Armoniac *and* Oil *of* Vitriol.

As for the ſenſible Heat of the Vapours which riſe from the Mixture of *Sal Armoniac* with *Oil* of *Vitriol*, it is not difficult to find the Cauſe, if we conſider that theſe Vapours are but the moſt ſubtile and active Parts of this Mixture, which the ſubtile Matter raiſes within it, croſſing it. The Motion of theſe Particles is free in the Air; but it is more repreſſed by the too groſs coagulated Particles. It becomes by ſo much the more violent, by how much it has been retained and hindred for ſome Time; and is perceived by Heat, which is the ordinary Effect of rapid and violent Motion.

I ſhall relate another conſiderable Experiment of the Cold Fermentation, cauſed by the Mixture of *Sal Armoniac* and *Oil* of *Vitriol*.

Change of the Cold *Ferment from the Mixture of* Sal Armoniac *and* Oil *of* Vitriol, *into very hot Ferment with a little* Water.

If after having made the Mixture of four Ounces of *Oil* of *Vitriol*, and one Ounce of *Sal Armoniac*, one throws upon it a Spoonful of common Water, in the time when the Fermentation is ſtrongeſt, the Cold is greateſt, and the Thermometer falls with the greateſt Quickneſs, the Ferment ceaſes, and the Cold changes immediately into a great Heat, and makes the Liquor of the Thermometer to riſe very high. One may eaſily conceive the Reaſon of this Experiment, if we conſider that the Water heating quickly and ſtrongly with the *Oil* of *Vitriol*, makes here the ſame Effect. And this Heat is ſufficiently great at that time to deſtroy the Cold of the coagulated Particles, the Water by itſelf being otherwiſe very proper to diſſolve this *Coagulum*.

Dr. J. Freind's *Defence of his* Chemical Lectures, *&c.* *n.* 331. *p.* 330.

X. When I publiſh'd my Chemical Lectures, I had a Suſpicion that I might give ſome Offence to the Chemiſts. For being an unknown Author, I made bold to reſcue a moſt uſeful Art from thoſe Fables and fanciful Opinions, with which they had too long obſcured it, and endeavour'd to place it in a proper Light. I made no doubt but ſuch as had any Regard for Truth, would be ſo fair, as to give a Writer Thanks who ſhould produce any thing new in this Part of Philoſophy, and ſhould be the firſt to reduce it to the Principles of Nature, ſuch as ſhould be ſound and inconteſtable. But the Matter has fallen out otherwiſe than I expected. For the Editors of the *Leipſick* Acts, not meddling with the Experiments produced by me, nor the Manner in which I have endeavour'd to reduce them to the Laws of Nature, have attempted to overthrow the Principles themſelves, which have ſo long been held as certain, and on which my whole Explication of Chemical Matters depends. This they do at the firſt Onſet, without giving any Account of the Book itſelf, that no one might read it without firſt being prejudiced againſt it. And ſurely theſe their Cavils are the leſs to be tolerated, becauſe on this account they go out of the Limits of their Province. For all that theſe ſcribbling Index-makers pretend to, is in a compendious Way to relate ſimply and faithfully what is contain'd in a Treatiſe, but to leave the Judgment of the Reader free and unbiaſs'd. For a Foundation of the Theory of Chemiſtry, I aſſumed the Principles, and the Method of arguing from them, which *Newton*, the Prince of Mathematicians and Philoſophers, has introduced: which great Man, by his own excellent Genius, has taught us a ſure Way for the Improvement of Phyſics, and has fix'd natural Knowledge on ſuch weighty Reaſons, has enrich'd it with ſuch a Number of new Diſcoveries, that he has done more to illuſtrate and explain it than all the Philoſophers of all Nations. I ſhall therefore lay open, in a few Words, the Doctrine of this moſt ſagacious Man, becauſe the Editors ſeem to know nothing of it; and I ſhall ſhew, that whatever we have in this kind of Knowledge that is compleat and ſatisfactory, is derived from this Way of reaſoning. Then I ſhall make it appear, that the Arguments they uſe to undermine this Doctrine proceed from the falſe Notions they have entertain'd of this Matter; and that more ſuch Shadows of Reaſons which they have recourſe to, may be brought againſt their own Principles, than againſt thoſe of *Newton*.

The *Carteſians*, and almoſt all thoſe that profeſs themſelves Maſters of the Mechanical Philoſophy, always proceed in this Method, to aſſume ſome Hypotheſis or Fiction, which no where exiſts but in their own fond Imaginations. Then, in Words that are neither clear nor determinate, they contrive Means how Nature ſhall adapt every thing to the Rule of this Hypotheſis. But *Newton* proceeds in a very different Way. He feigns nothing, he aſſumes nothing that is precarious, he takes nothing for granted but what is known by Experiment and Obſervation, and is evident to all by the Uſe of their Senſes. From theſe Principles, with mathematical Accuracy, he deduces all his Concluſions, which then he happily accommodates to the explaining the other Phænomena of Nature. Proceeding in this Method, he has moſt elegantly demonſtrated, that the Planets move round the Sun with an elliptical Motion, and always deſcribe Areas correſponding to the Times. Alſo that the Satellites revolve in the ſame Manner about the Planets, which they continually follow as Companions. Hence he has put it out of all doubt, that the Planets have a Tendency or Inclination towards the Sun, and the Satellites towards their primary Planets; and that this Inclination decreaſes in a duplicate Ratio of the increaſing Diſtances. Therefore that in all Bodies there is an immutable Force, by which they are urged towards one another. And hence it is that the Inflection of the Moon towards the Earth amounts to the ſame as the Force of Gravity, and is the Cauſe of the reciprocal Approach and Retreat of the Sea. This Inclination or Attraction, if they pleaſe, they may call an occult Quality, and I believe it will always remain occult. Nor do I yet ſee, that any one of the Editors is ſo acute in the more recondite Philoſophy, as to explain to us, by what Means and by what mechanical Force Nature performs this Attraction. But however occult this Force of Nature is, in regard to its Cauſe, yet by no means can it be call'd a Fiction or Hypotheſis, which, by their own Confeſſion, muſt be ſaid of their Principles: For that it exiſts as ſurely as the Sun and the Planets, may be proved by irrefragable Arguments. Now if it be a Principle of that Kind, that it perpetually inheres in all Matter, why may not Philoſophers adapt it to their Purpoſes, and explain to us, by its Means, how many Effects are produced, which fall under daily Obſervation?

In like manner, by conſtant Obſervation, and moſt convincing Experiments, the ſame *Newton* has diſcover'd the different Refrangibility of the Rays of Light; and hence he has ſo happily laid open the admirable Nature of Light and Colours, that all muſt acknowledge this Part of Opticks was treated of before him but in a very ſlight and ſuperficial manner.

It appears therefore that this is the true Method in which Philoſophers muſt proceed, in their Inveſtigation of real Science. Firſt, they muſt ſearch out the Natures and Forces of Bodies by a multitude of Experiments; then neglecting to inquire into the Cauſes from whence they proceed, they ſhould purſue and explain the Phænomena that reſult from the innate Virtue of every one. The divine *Archimedes*, proceeding in this Way, ſearched into the Laws of Mechanicks and Hydroſtaticks; but did not amuſe himſelf with ſettling the Cauſe either of Gravity or Fluidity. By taking for Principles only that which is perceiv'd by our Senſes, he very ingeniouſly penetrated into the Myſteries of both thoſe Sciences. And ſo likewiſe *Galilæus*, tho' he advanced no Hypotheſis concerning the Cauſe of Gravity, yet he found out the Velocity of the Motion which heavy Bodies acquire by falling, the Courſe and Impetus of Projectiles, and was the firſt that explain'd the reciprocating Motion of Pendulums; and laid thoſe Foundations of Science, upon which the greateſt Maſters in Phyſics have built their fineſt Inventions. Again: Have not Mathematicians proceeded with great Succeſs in illuſtrating Opticks, by taking for granted the two Principles of Reflection and Refraction, altho' their true Cauſe is hitherto known but to very few?

If the Authority of the Editors were of any Weight, theſe notable Diſcoveries of very ingenious Men muſt be wholly rejected, for no other Reaſon but becauſe they are derived from ſuch Powers of Bodies, whoſe Origin and Cauſes are altogether unknown; *nor can be commodiouſly explain'd without that occult Quality, which confounds the Principles of true Philoſophy, and reduces it to its ancient Chaos.* I find that the learned *Wolfius*, in his *Aërometria*, has recourſe to the Gravity of the Air, as a Principle which he requires to be granted him; and from thence has clear'd up many Phænomena of Nature to good purpoſe. Yet he does not once mention any mechanical Cauſe of Gravity; nor do I believe that any Hypotheſis has been yet propoſed for explaining this Cauſe, which *Wolfius* himſelf cannot eaſily prove to be very remote from Truth. Will therefore the Editors object to him, that he introduces an occult Quality into Phyſics? *Newton* has gone fartheſt of any in promoting this Gravity, which we know to be a ſenſible Quality. For he ſhews it to ariſe from an attractive Force, which propagates itſelf on all Sides through all Matter. This Force the Editors, by that Authority they claim in philoſophical Matters, call by the Name of a Figment. But it is hard to underſtand by what Propriety that can be call'd a Figment, which is proved really to obtain in the nature of things. *Newton* has very clearly explain'd that Species of Attraction, which prevails in the whole Planetary World; nor have I yet ſeen what, with any appearance of Reaſon, can be objected to the Demonſtrations of this moſt ſagacious Philoſopher. As to this other kind of Attraction, which decreaſes in more than a duplicate Ratio of the Diſtance, that it really exiſts, and exerts its Power eagerly in the minuteſt Corpuſcles, I have more Experiments at hand to prove it, than *Wolfius* can produce to demonſtrate the Gravity of the Air. Why then muſt the Principles, on which this whole Reaſoning is founded, in one of theſe Subjects be treated as fictitious, and in the other not? It is found by Experience, that Rays of Light proceeding either from the Sun, from the fix'd Stars, or from our common Fires, are alike attracted towards the Edges of ſolid Bodies. But this is an immutable Law of Nature, that where-ever Action is, there muſt neceſſarily be Re-action. Therefore we may very fairly conclude, that this Principle which we call Attraction really exiſts, and is univerſally diffuſed through all Matter whatever. And though it inheres in all Matter, yet that it diſplays its Force more ſenſibly in the minuteſt Particles, the very acute Philoſopher Dr. *Keil* has plainly demonſtrated.

But theſe Men ſay, *If ſuch things are once admitted, and a Licenſe of feigning introduced, others will invent other occult Qualities, or ſuch as themſelves*

themſelves own to be abſolutely inexplicable, and ſo by degrees we ſhall return to the old Refuges of Ignorance. If a Force of attracting is allow'd, or a Sympathy, why not a Force of repelling likewiſe, or an Antipathy? So an Antiperiſtaſis will be as eaſily granted, ſo Qualities emitted by the way of Species with their Potentials in Act; the attractive Chord of Linus; *a Variation of Extenſion in the ſame Matter, not only apparent but real.* Do they thus begin their Recital of Abſurdities, *If a Force of attracting is allow'd?* Does not manifeſt Experience ſhew that this muſt be allow'd? This is not a Matter of Opinion, invented to account for other Phænomena, but is itſelf a Phænomenon, and ſo conſtituted by Nature. And tho' the Editors here applaud themſelves, as having reduced the Maintainers of this Doctrine to ſomething like an Abſurdity; yet all the Argumentation, of which they boaſt ſo confidently, only amounts to this; That if ſome one Principle muſt be granted, which by certain Obſervation we find actually to exiſt in the nature of things, therefore we muſt admit others that have never exiſted. For Inſtance; if we acknowledge Gravity, which we are ſure is inherent in all Bodies whatever, tho' we are altogether ignorant of its Cauſe, therefore we muſt neceſſarily eſpouſe all the Fables and Whimſies of Philoſophers, which are neither confirm'd by Experience, nor can be proved by Reaſon. If this be reaſoning after the manner of Mathematicians, it were better to return to thoſe old Refuges of Ignorance, than to fall into ſuch a licentious Way of Argumentation.

Now they oppoſe attractive Force chiefly on this Account, becauſe it cannot be explain'd by mechanical Reaſonings. Therefore will they admit nothing into Phyſics, unleſs its Reaſon and Cauſe is underſtood? Has any one of the Editors ever explain'd the Elaſticity of the Air, or ſolved it upon mechanical Principles? Yet all Philoſophers take it for granted, and agree in applying it to the Solution of many natural Phænomena. We freely allow that an Artiſt may underſtand the Conſtruction of a Clock, tho' he does not know the Reaſon of Gravity or Elaſticity, upon which the whole Motion of the Wheels depends. Shall we deny the ſame Privilege to a natural Philoſopher? He that inveſtigates that Power by which all Bodies are actuated, all are directed in their Motion and Order; who can determine the Laws of this moving Power, and apply them to explain the principal Phænomena of Nature, tho' he frankly confeſſes he is quite ignorant of the Cauſe of this governing Power; ſhall we affirm that he knows nothing of Nature, and underſtands nothing of its Effects? Now if the Editors are deſirous of proſecuting this Principle of Attraction to the Fountain-Head, they may do as they pleaſe; *Newton* will leave this Glory to them. It is ſufficient for him, if, without giving Offence to the Editors, he may be excuſed from undertaking to ſolve a Problem, which he thinks to be very intricate and difficult.

I am well aware that the learned *Leibnitz*, whom the Editors regard as a kind of Deity, in that Specimen which he calls by a pretty ſounding

Name, *Dynamic*, has very plainly told us, that active Power or Endeavour conſtitutes the intimate Nature of Bodies. This Force or Endeavour, if I rightly underſtand what he means, is the ſame thing as that mutual Propenſion which we have ſaid is implanted in all Bodies, and which *Newton* had diſcover'd long before, tho' he had no where aſſerted that the Nature of Matter was contain'd in it. If *Leibnitz*'s Doctrine is true, it may with as much Reaſon be required of us to ſearch into the Cauſe of Extenſion and Solidity, as to inquire into the Reaſon of this attracting Principle, which is inherent in all Matter. If we lay this down as a Foundation, all the Effects which we perceive in this whole Machine of the World, derive their neceſſary Origin from the mere Conſtitution of Matter. But the intimate Nature of Bodies is ſo little known to me, that I am far from affirming this Force was neceſſarily inherent in them, and belong'd to them by the ſame natural Connection as Extenſion and Solidity. Certainly this Opinion ſeems to be ſo very ill grounded, that the Arguments which it would be eaſy to alledge againſt it can hardly be enumerated, and much leſs refuted. If the Editors eſpouſe Mr. *Leibnitz*'s Opinion, I cannot ſee why they ſhould reject a Principle, which he judges to be ſo very neceſſary, as to pronounce it to be conſtituted in the intimate Nature of Things. Since therefore it is evident from the Motion of all Bodies, that this attractive Power is really exiſting, if they think it is not neceſſarily inherent in Matter, nor to be mechanically explain'd, I think we ſhall not be guilty of any Abſurdity, or offend againſt true Philoſophy, if we reſolve it into the Will of God; and allow it to be an univerſal Law; by which this whole Machine of the World is regulated and govern'd, and the Harmony and Correſpondence of all Bodies are preſerved, whatever different Motions they are actuated with. Though even this Power, as well as the whole Conſtruction of Nature, is derived only from the Divine Will. They who will acknowledge no ſuch Law as this, but maintain that the whole Buſineſs of natural Philoſophy is perform'd of itſelf, and by ſome mechanical Power, and that not only as to the nearer Cauſes, but even the moſt remote; ſo that they imagine there is nothing but what proceeds from the Power of Matter itſelf, and an immutable Condition of Motion; what elſe do they do but, with *Epicurus*, root out of the Minds of Men the Notion of a God, who governs all things by his Providence, and ſupply Arguments to Atheiſts and impious Men.

Now whatever we may conclude about this attracting Virtue, there is no doubt but that the Nature of Things requires ſome active Principle to ſupport it. For Bodies, however at firſt put into Motion, if they were afterwards left to themſelves, could not ſo conſtantly perform their Viciſſitudes in a certain Time. When the moſt acute Mr. *Leibnitz* perceived this, he elegantly concluded, that to act in the Character of Subſtances. But where-ever this Force is conſtituted, that by its Motions agitates and ſtirs up all things, it muſt neceſſarily be reſolved into ſome occult Quality; for hitherto we have ſought in vain for a Cauſe different from that of the

Divine Will. Some who have thought themſelves to be very diſcerning in mechanical Matters, have placed this Power in the Ether, or ſome very ſubtile Fluid. Theſe I would aſk, What is it that actuates this Ether, and keeps it in perpetual Agitation? How is it that ſuch contrary Motions do not deſtroy one another? Again, What is it that endues theſe Motions with ſuch a Faculty, that each performs its own proper Office? All theſe things muſt ariſe from ſome occult Quality, which they pretend the Ether is endued with. For if we admit this Hypotheſis into Nature, it will ſoon appear that they introduce more occult Qualities than there are Phænomena to be explained by them. How much more rationally does *Newton* proceed in his Philoſophy? He only requires that one Principle may be granted him, and this a very ſimple one, and confirm'd by manifold Experience: From thence he deduces Wonders.

But that whole Hypotheſis of a certain Ethereal Virtue, or a ſubtile Fluid, under what Obſcurity it labours, and with what weak Reaſons it is ſupported, may be ſhewn by a very pregnant Argument taken from what the Editors have deliver'd about it. For they ſay, *All theſe things may be conveniently explain'd, and are already explain'd in part by learned Men, without this occult Quality of Attraction, which confounds the true Principles of Philoſophy, and brings us back to the ancient Chaos.* For this purpoſe therefore they conceive *there are very many Particles of Matter, that are ſurrounded by a certain magnetical Sphere of a ſubtiler Fluid, by the Motion of which (as comes to paſs in our Magnets) they attract or repel one another, or diſpoſe to a convenient Situation, as often as they obtain this Liberty.* I deſire to know what elſe is *a certain Magnetical Sphere*, but ſomething very occult? To which ſomething more occult is affix'd, that is, *Magnetiſm.* Whence is it that this Sphere of ſubtile Matter perpetually adheres to the Body which it ſurrounds? The Thing itſelf ſeems to require, that the Body, as ſoon as it changes its Place by impreſs'd Motion, ſhould have this ambient Sphere behind it. Thus, if the Earth were actuated by any new Impulſe, and ſo were obliged to change its preſent Courſe; it appears very plain from the Laws of Mechanicks, that not only the Atmoſphere, but whatever was looſe and at liberty on the Surface would be hurry'd away. What therefore are we to conclude in this State of Things? Whether that the Atmoſphere would immediately follow the Motion of the Body by a certain occult Quality, or that another Sphere of ſubtile Matter would again be produced by an occult Quality likewiſe? However this is, I ſhould be glad to know, what that Quality is which puts this Magnetical Sphere into Motion? Of what kind is this Motion, and how it is excited, which is the Cauſe that *the Particles of Matter attract one another, or repel, or diſpoſe to a convenient Situation?* How many occult Qualities are they forced to have recourſe to, to explain the ſeveral Phænomena, while they reject that one ſimple one, which is diffuſed through the whole Fabrick of Nature, and ſo admirably adapted to ſolve moſt of the Phænomena? This I cannot ſufficiently admire in the Editors, who ſo eagerly contend againſt attractive Force, and think they can account for every thing without it, yet they introduce it into their own Eſſays in natural Philoſophy. Nor do they abſtain from the Uſe of the word Attraction, which ſeems to ſound ſo elegantly in their Ears, that they might palliate their Ignorance. For they ſpeak of a certain fluid Sphere, *which attracts, repels, and diſpoſes to a convenient Situation.* As there is nothing of Truth in this Fable of a ſubtile Sphere, Care was to be taken, that that Agreement or Convenience might not be wanting, that would make the Matter probable. It would indeed be very eaſy to illuſtrate all the Phænomena of Nature in this manner; for this magnetical Sphere and ſubtile Fluid can do Wonders, and reconciles things that are moſt oppoſite to one another. And there can be no ſurer Aſylum for Ignorance than this Fiction which they have invented, concerning a ſubtile Matter and a magnetical Force. For it far exceeds all the occult Qualities that hitherto have crept into Philoſophy. Every one muſt perceive how fictitious and precarious they are; for what this ſubtile Fluid is, or whether there is one or no, can neither be known by Obſervation, or inferr'd by Ratiocination. Let the Reader determine, whether theſe their Weapons of Reaſoning, which they aim at the true or *Newtonian* Philoſophy, may not be retorted againſt this their weak Way of Philoſophizing. All thoſe things which, with Oſtentation enough, they advance as ſure and certain, are nothing but vain and fabulous, depending upon no Obſervation or Experiment. And if they were granted them as true, they are attended with ſuch a Tribe of occult and obſcure Powers, that it is much eaſier to comprehend the Nature of Sympathy, Antipathy, and Antiperiſtaſis. For I have always found, that this kind of Hypotheſes are ſubject to this Defect, and they are more obſcure and more difficult to underſtand than the things themſelves they are introduced to explain. In that Hypotheſis of Vortices, of which above all they ſeem to be fond, they alledge no Reaſon why the fluid Matter ſhould affect a curved Paſſage, and turn itſelf about a Centre, ſince the Nature of all Bodies is ſuch, as to move in ſtrait Lines. Whence is it provided in ſo many Vortices, that they ſhould not diſturb and hinder one another in their Courſes? Whence is it that the Comets paſs through them, and wheel about by a Motion contrary to that of the Vortex? Their very ſwift Converſion is ſo far from hindering them, that in their Orbits about the Sun they are directed by the ſame Law as the Planets, and in a like manner are inflected towards him. In this Hypotheſis of Vortices theſe philoſophical Artiſts entangle themſelves in ſuch Snares, that they can never get clear of them; and yet in this conſiſts the whole Foundation of this kind of Philoſophy. When they undertake to explain any Phænomenon, their ſubtile Matter is ready at hand, which can perform whatever they pleaſe, in a Manner and by a Motion which is entirely unknown and inexplicable. Is this more becoming Philoſophy, than if any one ſhould ſay they proceed from Sympathy, Antipathy, or ſome occult Quality? Will not this Manner of philoſophizing, as much as that which they carp at, become a mere Aſylum for Ignorance? And if we comply with Cuſtom, which is ready enough to indulge ſuch Romances, why may we not embrace thoſe other Whimſeys, which are contrived by Men ingenious at Invention?

How far different and unlike to this is the true Method of cultivating philoſophical Knowledge! In this nothing is ſuppoſed but what moſt evident Obſervation pronounces to be the Conſtitution of things; and tho' the Cauſe and Origin of the Principle we make uſe of is conceal'd from us, yet from this many things may flow, which daily Uſe will inform us of, and may depend upon it. Therefore it is the Buſineſs of an ingenuous Philoſopher, firſt to deduce the Powers of Bodies by Experiments; and afterwards, when they are carefully examin'd and eſtabliſh'd, to ſhew diſtinctly and plainly what other Effects will neceſſarily follow from them. Nor can I think that any of the Arguments produced by my Adverſaries are of ſuch Weight, as to ſubvert this Method of inveſtigating Truth. For, if the Principles and Poſtulates are fully verified by Experiment; if the Propoſitions are granted and duly premiſed, and nothing is urged contrary to the Rules of Logick; the Concluſion cannot but be moſt certain and indubitable. So that whatever we have that is examin'd and explain'd in this manner, may be deſervedly eſteem'd as improving and enlarging natural Philoſophy by Diſcoveries. Therefore we truſt that we are ſtill in full and firm Poſſeſſion of this attractive Force, notwithſtanding the Endeavours of the Editors to wreſt it from us.

There is alſo another Axiom, which has not the Conſent and Approbation of the Editors; that is, *The Moments of Bodies, or the Quantities of their Motions, are in a compound Ratio of their Quantities of Matter and their Velocities.* They that think thus (according to them) *are in a common Error, as in their Acts is frequently obſerved.* In them indeed I find a little Diſcourſe or two about this Matter of the learned Mr. *Leibnitz*. But he is ſo far from giving any Reaſons, that he has nothing but ſome fallacious and minute Concluſions, or Diſputes about Words. Therefore what he has produced about this Argument is diſapproved of by almoſt all Mathematicians; ſome of which have very well defended this Axiom. The Reader, if he pleaſes, may conſult theſe; for the Diſpute, as it is copious enough, ſo it is too foreign from my Purpoſe here.

But now it is time to diſmiſs the Editors with a good Grace. For I muſt acknowledge this Civility of theirs, that by not denying it they ſeem to confeſs, that I have properly apply'd to my Deſign the Principles I have uſed, if thoſe Principles are but true.

XI. *An Account of a Book omitted.*

Prælectiones Chymicæ, *Oxoniæ* habitæ, à *Johanne Freind*, M. D. *n. 320. p. 312.*
Ædis Chriſti Alumno, 8*vo*.

The End of the FIRST PART.

THE Philoſophical Tranſactions ABRIDG'D.

PART II.

CONTAINING

The *Philological* and *Miſcellaneous* PAPERS.

CHAP. I.

Manuſcripts, Printing.

I. THE Subſtance of what your Grace is pleas'd to ſay about *Manuſcripts* and *Copied Writings* (as I apprehend it) is, *That 'tis not only poſſible, but very eaſy, upon the Peruſal of a written Book, to pronounce in what Age or Century it was written, ſuppoſing a Man to be tolerably well rſed in Books of that Language or Country. And that this Judgment may e made, only by obſerving the Shape and Figure of the Letters of the Book, which (as all other Things) have their fixed Periods for their Duration: As eing form'd this way in ſuch a Century, and ſuch a way in the next; Time only (which alters the outward State of other things) working this Change in Letters alſo, of what Age, Language, or Country ſoever they be.* And then as

Of the Age of MSS. Authors, Painters, Muſicians, *&c.* (*in a* Letter *to a Rev.* Prelate) *by Mr.* H. Wanley, *N.* 300. P. 1993.

to Original Compoſitions, your Grace is of Opinion, *That the Style and Diction of any noted Author being well obſerved, 'is very eaſy to diſcover ſuch others of his Works as have gone abroad without his Name; and alſo the very Time when the Author liv'd.*

'Tis evident, my Lord, that a Man may judge of *ſome* MSS. by the Hand; and of the genuine and ſpurious Works of *ſome* Authors; and of the *Time* likewiſe, wherein they lived, by the *Style* of them: But whether this be ſo *eaſy* a Work, and that the Rules Men generally go by in theſe Caſes, are *always infallible Guides*, is what (I own) I very much doubt of.

Suppoſe, my Lord, for Inſtance, a Man ſhould bring to any Antiquary a good MS. Copy of the *Hebrew Bible*, *Pentateuch*, or *Pſalter*, written in a ſmall common Letter, without Points, without fine Knots, and Flouriſhes, without Pictures, and great Letters, or any thing that ſhould look like pompous: Suppoſe that the Ink, Parchment, *&c.* ſhould carry a ſeeming Face of Antiquity with them, and that a Man ſhould ſay his MS. was 1000, 1200, or 1300 Years old, when as really it was written within a very few Years: Could he from the Hand alone ſoon find out the Cheat?

All the *Hebrew* MSS. that I have as yet ſeen, are written either with *Samaritan* or *Chaldee* Letters. As to the *Samaritan*, I own they bear a good Reſemblance one to another, and that they differ very much from thoſe *Samaritan* Characters, which we find ſtamp'd upon divers truly *Ancient* and *Genuine Coins*. But then there ſeems to be ſuch a Reſemblance (as to the Character) between thoſe Coins ſtruck in Ages far diſtant from one another, that 'tis hard (from the Conſideration of the *Metal*, its *Fabrick*, *Weight*, from the Shapes of the *Letters* in the Inſcription, *&c.*) to ſay which Coin was made in the Time of *David*, or *Solomon*, and which no older than the Time of the *Machabees*; this being rather to be gather'd from the *Words* and *Meaning* of their Inſcriptions, than from the Figure of the Characters which compoſe them. The ſame may be ſaid, in a great meaſure, of the old *Greek*, *Punic*, *Roman*, *Britiſh*, and other Coins.

The *Chaldee* Character has indeed varied in Tract of Time, according to the different Fancies and Humours of Men. The *even plain* Letter, I think, is the moſt ancient. This they altered into a more *neat* way of making it, as your Grace finds in *R. Stephens's Hebrew* Bibles. There is a third Faſhion, of *waving* the perpendicular Strokes like Rays, as your Grace remembers in ſome of the *Hebrew Coins* exhibited in the *Prolegomena* to the *Polyglot* Bibles. Then fourthly, there is a *large fat* Letter in the MS. *Rituals* and *Liturgies*, beſides the *Rabbinical Letters* of *Italy* and *Germany*, with their *Offspring*; the *Literæ Coronatæ*, and perhaps others that I never ſaw: (Not to mention here the *Jewiſh* Cuſtom of writing the *Vulgar Language* of the Country, wherein they live, with *Hebrew Letters*). It ſeems a hard matter, my Lord, to trace the *Original* and *Progreſs* of all theſe Ways of Writing,

ting, ſo as, upon the bare Sight of a MS. written in the *Hebrew* Language or Character, to ſay, *by the Shape of the Letters of this Book it appears to be ſo old*: And it ſeems much more difficult to aſſign the particular *Province* or *Country* wherein each *Hebrew* Book was written: As for Example, in *Italy*, *France*, *Spain*, *Portugal*, *England*, *Holland*, *Germany*, *Poland*, *Barbary*, *Perſia*, *India*, in the ſeveral Provinces of *Turkey*, &c.

The ſame almoſt may be ſaid of the *Greek Manuſcripts*, in which Language there has been a great Diverſity of Writing, according to the *different Humours of the Scribes*, the *Faſhion then in uſe*, or the *Manner of that particular Province*, in which ſuch a Book was written. Nor is it *eaſy* (tho' one would be apt to take ſuch *Differences* for ſo many Landmarks) to tell the Age of a *Greek MS.* without the Date; and I never yet ſaw ſuch a *Date* ſo high as the Year 6400, according to the *Greek* Computation. And it is ſtill much harder, from any Remarks about the *Character*, *Illumination*, *Ink*, *Parchment*, *Paper*, *Binding*, &c. to find out what * *Country*, *Province*, or *Iſland*, ſuch a *Greek* Book ſhould be written in, or what *Countryman* the † *Scribe* ſhould be. Nay, and what does farther add to the Difficulty, is, that 'tis known that the Shapes of the *Majuſcule* Letters found in *Greek* MSS. have been retain'd for above 600 Years together, with little Variation; and alſo, that ſome MSS. written with *Minuſcules* and with Accents, are older than ſome others which want them. And alſo, that the preſent *Greek Copiſtes* or *Librarii* have three or four different Hands commonly uſed by 'em, one being their own *Common Hand*, the others an Imitation of old MSS. which are more beautiful, but troubleſome in writing, than their ordinary running Hands: It being cuſtomary, as I have been told, when a Man wants a Copy of ſuch a Book to be written, for the *Copiſte* to aſk in what Hand it muſt be written, (for one Hand, it may be, is more coſtly than another;) and ac-rding as they agree, the Book is written. And thus I have ſeen ſome very new Things written in the ſame Hand with Books which are certainly Years old.

What Methods learned Men have taken, in order to inform themſelves of the *different Ages of MSS.* I know not; but my own has been this. I have been careful to get all the *Dates* I could, wherein

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* If a Man is born in one Country, and writes a Book in another, keeping ſtill to the *Character and Manner of Writing* uſed in his own Country, I look upon it as the ſame thing as if he wrote it at home. And therefore I look upon the *Greek* MSS. which *Angelus Borgecius* wrote at *Paris*, as if they were written in *Candy*, where he was born. And ſo (amongſt many others) to inſtance in a *Latin* MS. I look upon a Copy of Pope *Gregory*'s Paſtoral Care, now remaining in the *Bodleian* Library) as a noble Moument of our *Saxon* Anceſtors: Tho' St. *Willibald* wrote it, perhaps, at *Mount Caſſinum* in *Italy*, and afterwards (as it is probable) carried it with him into *Germany*, where it remain'd at *Wurtzburg*, till that City was plunder'd by the *Swedes* about 70 Years ago.

† Now this may in ſome meaſure be done by *Latin* MSS. becauſe there are greater Plenty of them. For even I, by exactly obſerving the Nature of the Characters, *&c.* of thoſe MSS. whoſe Country I was ſure of, have afterwards been enabled to ſay, that this *Book looks as if it had been written in* France, Italy, Spain, Germany, *the* Netherlands, England, Ireland, *&c. and*, it may be, *about ſuch a Time.*

'twas ſaid that ſuch an individual MS. was written, at *ſuch a Time*, or by *ſuch a particular Perſon*; every Book with a *Date* being as a *Standard* whereby to know the Age of thoſe Books of the *ſame* or a *like* Hand, and of thoſe that are not very much *older* or *newer*. Where Dates have been wanting in ſome Books, perhaps they have had ſome Succeſſion of *Emperors*, *Kings*, *Popes*, *Biſhops*, or other *Officers*; and ſetting down the Continuance of their Predeceſſors for ſo many *Years*, *Months*, and *Days*, if there be only the naked Name of him who is the *laſt* in order, (all other Circumſtances concurring,) I then judge the Book to have been written during *the Life or Reign* of ſuch a Perſon. Eſpecially if that Succeſſion be afterwards continued by a more recent Hand, or that there be two ſuch Succeſſors, as of *Kings* and *Biſhops*, and the *laſt* of each happen to be Cotemporaries. Other Obſervations I have made from *Hiſtorical Notes*, and *Eccleſiaſtical Tables*, in ſome Books. At other Times I light upon ſome *Authentic Charter*, or *Original Writing*, in the ſame Hand with ſuch a Book as I have remembred to have formerly ſeen, but without any Gueſs at the Age of it. The Age of the *Charter* being known, that of the *Book* is then known alſo: For I never entertained any Notion, or relied upon any Obſervation, but as I found it confirm'd by the Suffrage of concurring Circumſtances, and ſufficient Authority.

But even in *Dates*, I have found that a Man ought to be very cautious; for ſome have been *altered* by latter Hands, for corrupt and baſe Ends. Some are ſo worded, as when one thinks that the time they mention, is the time when the MS. was finiſhed by the *Copiſte*, or *Book-writer*, it is meant only as to the Time when the *Author* finiſh'd his Compoſition. Other Books are *poſt-dated*, that they might be accounted new. Of this laſt kind is a *Greek* MS. I ſaw in the Univerſity Library at *Cambridge*, which, as appears by a written Annotation therein, was bought ſuch a Year at *Rome*, for ſo much; and yet the Date pretends that the Book was *written* at *Rome* in ſuch a Year, which happens to be two Years after it was bought and paid for. The Reaſon of theſe *Poſt-Dates* was, becauſe, before Printing came up, a Book was, by how much the *newer*, by ſo much the more *valuable*. An *old Book* might be bought for an *old Song*, (as we ſay) but he that tranſcribed a freſh Copy muſt be paid for his pains. And therefore I have found in ſome Catalogues of the MSS. formerly extant in our *Abbey-Libraries*, that when they ſaid ſuch a Book was *Liber vetus*, they would often add, *& inutilis*; but *Liber novus* was *nitidus*, *eleganter ſcriptus*, *lectu facilis*, *&c.* which mean Opinion of the Antient Copies, by the way, may have been the Occaſion of the Loſs of many a good Author.

The *Librarii* or *Book-writers* were from the Time of the *Romans* a particular Company of Men, and their Buſineſs a Trade: But tho' *Book-writing* was their Profeſſion, yet they afterwards had but a third Part of the Buſineſs.

Learning (after the Erection of Monaſteries,) was chiefly in the Hands of the *Clergy*; and they were for the moſt part *Regulars*, and lived in Monaſteries. Amongſt theſe were always many induſtrious Men, who wrote continually new Copies of old Books, for their own Uſe, or for the Monaſtery, or for both; which ſeems to have ſwallowed up above half the Buſineſs. Then, if an extraordinary Book was to be written, for the *ſtanding, and more particular Uſe* of the Church or Monaſtery, the *Antiquarius* muſt be ſent for, to write it in *large Characters, after the old Manner*, and ſuch a Copy they knew would laſt for many Ages, without Renovation. Between theſe two Sorts of People, the *Writing Monks* and *Antiquarii*, the poor *Librarii* or common *Scriptores* (who had Families to maintain) could hardly earn their Bread. This put them upon a quicker way of Diſpatch, that ſo they might under-ſell one another: And in order to this Diſpatch, they would employ ſeveral Perſons, at one time, in writing the ſame Book, (each Perſon, except him who wrote the firſt Skin, beginning where his Fellow was to leave off): Or elſe, they would form the Letters *ſmaller and leaner*, and make uſe of more *Jugations* and *Abbreviations* than uſually others did. And, this, my Lord, is the only Account that I can give, for that *Variety* of Hands which in former Ages, being learnt of, or borrowed from the *Romans*, was commonly uſed, and in Faſhion at the ſame Time, and in the ſame Country, (throughout theſe Weſtern Parts of *Europe*,) and for the growing leſs and leſs for one Age after another. An Inſtance of this may be given from the *Hands of England*, which about the Year of our Lord 730 were of three Sorts.

I. The *Roman Capitals*, ſtill retained, and kept up by the *Antiquarii*, in ſome Books and Charters.

II. The more *Sett Saxon Letters* (which have a near Affinity with the *more Ancient Iriſh Characters*, as being with them derived from the *Roman*,) which were uſed as the common Hand of the Age, by the Monks in their *Books*, and ſome *Charters* of their dictating and writing.

III. The *Running Saxon Letters*, fuller of Abbreviations, and ſomething of kin to the *Longobardic* and *Franco-Gallic*, (both which, with this third Sort, were alſo of *Roman* Original,) and was uſed by theſe *Librarii* in their Books and in the Charters; as alſo by ſome Authors who wrote much, as *Bede*, &c.

There was another ſort of *Book-writers* ſtill in uſe, namely, the *rii*, whoſe Buſineſs it was to take *Trials* and *Pleadings* at Courts dicature; to *write* as *Amanuenſes* from the Mouth of an Author; take *Homilies* and *Sermons* at Church, from the Mouth of the er. Theſe *Notarii* made uſe of *Notæ* or *Marks* inſtead of Letters: But when, in proceſs of Time, Letters were uſually written nall and quick, and Abbreviations grew common, the *Notarii* were n'd off, unleſs they would write Books in *Long Hand*, as other *Librarii*

brarii did, and their *Notæ* grew out of Uſe; and moſt of their Performances in *Notes* or *Marks* have been ſince deſtroy'd.

Suppoſe then, my Lord, that a Man had one *Latin* Book of each of the four Sorts above-mention'd laid before him, written all at a Time, and without any *Date* or *Note* of the Age: Would not he be ready to ſay that the three firſt were older than one another? As that *That* in *Capitals* was older than *That* in the *middling* Hand; and this again older than that in the *running* and *ſmaller* Hand? And that ſuch a Book written in the *Notæ*, being all full of Marks, was not *Latin*, but of ſome other unknown Language? But to come down later: Suppoſe that a Perſon ſhould have ſome recenter *Books* or *Charters* laid before him in the *Pipe*, *Text*, *Exchequer*, *Chancery*, *Court*, and *Common Hands*, all written at the ſame Time, would not he be apt to ſay, that one ſeem'd to him to be older than another, and that they were the Hands of ſeveral Nations?

If it be difficult for an inquiſitive Perſon to be a perfect Maſter in all the Succeſſions of Hands that have been uſed in his own Country, ſo far as he may be guided by the Monuments therein extant, (and I never heard of any Man that was ſuch a Maſter) ſurely, it muſt be more difficult to pronounce the Age of thoſe Books, *from the Hand*, which were written in other Countries, in an unknown Language. And what may make a Man yet more liable to Miſtakes, (beſides the Want of Dates in the moſt ancient *Greek*, *Latin*, and other MSS.) was the Practice of many Writers, ſtill to uſe the very ſame Hand when in Years, as they learnt when they were young; like as many ancient People, who do yet continue to write the *Roman* and *Secretary Hands*, which were more faſhionable fifty or ſixty Years ago, than now. I forbear to trouble your Grace with any more Words upon this Head, or to make mention of the different Ways of writing in any other Language; becauſe I find this Letter will prove larger than I intended. I will therefore (with your Grace's Leave) touch upon the next Head in your Grace's learned Eſſay, ſhewing the great *Eaſineſs* of finding out an Author, and the Time he lived in, by his *Style* and *Phraſe*.

I wiſh, my Lord, that it was as eaſy to diſcover the *Villanous Authors* of ſome Treaſonable and Scandalous Libels by their *Style*, as it has been to find out the *Printers* by the *Paper* and *Letter*. Could this be done, it might not be unuſeful to the Government. But People have learnt the Knack of changing their Style, upon Occaſion, ſo artificially, as not to be diſcovered, but when they themſel are willing to be known. Who would have thought that *E mus* wrote the *Epiſtolæ obſcurorum Virorum?* Or that ſome of the n nay, the moſt eminent modern Criticks could have been impoſed on by their familiar and near Acquaintance, who trump'd upon the their own recent Performances for invaluable Fragments of the cients, whoſe other Works theſe very Criticks had lying before th

It has been a frequent Practice, in all Ages, for poor Scribblers to father their wretched Offspring upon illuſtrious Perſons: And the Diſparity between the genuine Works of the one, and the ſpurious Pieces of the other being evident enough, it has been eaſy to diſtinguiſh between the Gold and the Braſs. But I would humbly aſk this Queſtion, Is all, that is even now by learned Men aſcribed to ſome ancient voluminous *Greek* and *Latin* Authors, undoubtedly theirs? May not there ſtill ſome ſuppoſititious Pieces lurk among them, which have the Luck to be received, only becauſe they have been more ingeniouſly counterfeited? Nay, may not the ſame Perſon, in the Courſe of his Life, even alter and vary his Style and Phraſe unwittingly, and without any Deſign to do ſo? I think Mr. *Richardſon*, ſomewhere in his Anſwer to *Amyntor*, upon occaſion of the Difference in point of Style between the *Revelation* of St. *John* and his *other Works*, between the *Prophecy of Jeremiah* and his *Lamentations*, does tell us from Dr. *Cave*, that the Conſideration of the *Times when* a Man writes, or of the *Perſons to whom*, or the *Subjects about which*, or the *Temper of Body*, or the *Humour* he is in when he writes, or the *Care and Pains* that he takes in writing, may occaſion ſuch Alterations in his Style, as that no certain Rule can be inferr'd from thence.

And if, my Lord, it was really poſſible to find out the Time when an Author liv'd, only by diligent *reading* his Works, ſurely the World would have been long ſince agreed as to the Time when *Homer* liv'd, though they could not tell where he was born. And I believe even in the Liſt of *Eccleſiaſtical Writers* there are ſome, and thoſe not of the leaſt Conſideration, who (notwithſtanding their Works have been read over and over) are ſtill reckon'd to be of *uncertain Age*.

Of Painters.

As for *Pictures*, though I have much leſs Experience in them, than I had once in MSS.; yet I will not deny but that the Works of an hundred Maſters (beſides thoſe your Grace has been pleaſed to mention) may be known by the *Hands*, though they may be almoſt as *different* as their ſeveral Hands in writing: but that one Painter can't copy from another ſo exactly, as that in Tract of Time it ſhall not be known which Picture is the Original, is what I dare not aſſert.

It has been frequently practiſed by Painters to borrow Pictures of thoſe who are Lovers and Judges of ſuch things, to copy them, and to return their Copies for the Originals, without any Diſcovery made
the diſcerning Owners. And I believe it poſſible (though exceeding
icult) for a great Maſter to copy a Picture ſo, that when they both
id together, a good Judge ſhall not dare poſitively to ſay which is
Copy, and which not: Nor he that drew the Original dare to
n, that he could imitate his own Handywork better than a Stranger
done. There are a great many Stories common among Painters,
this purpoſe. And one would not think it much more difficult
a Man to imitate a Drawing or Picture, than to counterfeit an-

other Man's Hand-writing, which ſome People can do moſt exactly. And others with Pen and Ink will copy after any thing that is printed ſo nicely, as that one would affirm their *Writing* to be *printed off* at the Preſs.

Your Grace's Notions of diſcerning the *Age*, as well as the *Hand* of the Painter, by his Picture, is very curious, and altogether new to me: And I doubt not but there is a great deal in it. I only want the whole Works of ſome great Painter, with an Account of the Time when he wrought each Piece, to fit me for the making the Experiment. And why might not this Notion be advanced a little farther, and the Painter's *Complexion* be known by his Pictures, as well as his Age? As ſuppoſing that the *Sanguine* do naturally run upon *Pourtraits*, *Poetical Hiſtories*, *Nudities*, *&c.* The *Cholerick* upon *Battle-pieces*, *Sea-fights*, *Fire-pieces by Land or Sea*, *Tempeſts*, *&c.* The *Phlegmatic* upon the *Still-Life*, *Flower-pieces*, *Birds*, *Beaſts*, *Fiſhes*, *&c.* and the *Melancholick* upon *Landſkips*, *Architecture*, *Pieces of Perſpective*, *&c.* Not but that the different Genius of a Country, or the Deſires of a good Cuſtomer, may oblige a Painter to work upon a Subject, which he had no great Fancy for.

As to the Difference in the Works of Painters grown old, in reſpect of what they did when young, I doubt no certain Rules can be eſtabliſhed as to their Performances in that kind. I know, my Lord, that Painters do generally live faſter than other Men, which may at length occaſion a Failure in their Sight and Memory, a Trepidation in their Hands, *&c.* And yet I never heard that *Michael Angelo*, *Alb. Durer*, *Titian*, and others, painted worſe at the latter End of their long Lives, than they did before. Nay, I heard that *Signior Verrio*, though grown old, paints now far better than ever, and is grown almoſt aſham'd of ſome of his own Works which he painted at *Windſor-Caſtle* in the Time of King *Charles* the IId. There may be this in it, that aged Perſons having attain'd, through long Practice, to a greater Experience, to a more ſolid and mature Judgment than they had when younger, and more cautious of that which they let go out of their Hands; and correct thoſe flaſhy Touches of their Pencil, and other ſuperfluous Irregularities, which they and others were formerly very fond of.

As for the *Flame and Motion of the Eyes* in a Picture, or the *Breath in its Mouth*, I can ſay but little, having as yet never had the Happineſs to ſee ſuch Rarities, tho' I have been admitted to the Sight of ſome of beſt Pieces of the moſt celebrated Maſters.

As to the Painters painting a living or moving Thing, ſo tha ſhall almoſt *diſcern* the Motion, and *ſee* the *Bird flying*, *the Horſe Hound running*, *&c.* that is more eaſy, eſpecially when aſſiſted w the friendly and pregnant Fancy of the charm'd Spectator. In t *ſtill Life*, indeed, the Eye is quickly deceiv'd; and though there a I believe, ſeveral Maſters now living more excellent at it than ev

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Zeuxis and *Parrhaſius* were; yet ſtill, with all their Art, 'tis very difficult to impoſe upon a Man ſo, as to make him believe 'tis not a *Picture*, but the very *Life* that he ſees before him.

Of *Muſicians.*

Muſicians ſeem to be under the ſame Predicament with *Painters*, ſince they are obſerv'd to live *faſt*, as alſo the *Poets*. 'Tis by the Practice of many Yerrs that they attain to a juſt Knowledge and Maſtery in their reſpective Arts; and as their firſt Compoſitions are little and light, ſuitable to the mercurial Temper of heedleſs and inconſtant Youth, ſo, in time, this wears off; and as their Experience and Judgment increaſes, their Compoſitions grow more ſolid and ſound. A young Man may make a better *Minuet* or *Jigg*; but the Elder a more ſound *Service* or *Anthem*. The Muſic of the former (with other Accompliſhments) may go a great way towards the enticing a fooliſh Girl to Love; but that of the latter excites the Devotion, moves the Affections, and raiſes the Paſſions of thoſe truly religious Souls, who take pleaſure in ſinging Praiſes to the Honour and Glory of his Name, who lives for ever and ever.

If your Grace ſhall ſay, *That the very beſt Painters, Muſicians and Poets died young, or at leaſt before they attain'd to an advanc'd Age, when they would have fail'd or grown dull, as others did:* I muſt beg Leave to ſay that old Men are of two Sorts, either thoſe who *are much affected* with their Age and weakned, or thoſe who *are not.*

If a Man be born of unſound Parents, or hath liv'd all along in an Air diſagreeable to his Conſtitution, or has his Conſtitution always unhealthful, or has liv'd an intemperate or debauch'd Life, or has been cruſh'd by any heavy Misfortunes, or always liv'd in Poverty or Diſcontent; 'tis no wonder, if, in ſpite of all this, he attains to old Age: but then he will probably loſe the Clearneſs of his Head, the fix'd Attention of his Mind, the Brightneſs of his Parts, which he might be formerly noted for. If a Man has never had any of theſe Diſadvantages to wreſtle with, but has all along been bleſs'd with the contrary: Then, he being bred up to a Profeſſion, and always following it, his Judgment therein ſtill increaſes, and his Hand (one would think) ſhould be more nimble and ready, and the Man a better *Painter*, *Muſician* or *Orator* than ever; and why not a better *Poet* too? I ſay, with Submiſſion, my Lord, if Mr. *Dryden* (though he was ſaid to be unhealthy at laſt) wou'd have taken as much Pains, or had been allowed Time to s Mind for reviſing his latter Poems, as in ſome of his former, they ight have been as well, if not better accepted. I don't ſee that 'tis *old* that does a Man this Diſkindneſs, but rather, that 'tis the *Accidents* t do too often attend it, which yet many are freed from to the very t.

Suppoſe then, my Lord, if *Raphael* or *Vandike*, or the late Mr. *Purcell*, or *Aleſſandro Stradella*, ſhould have continued their Practice f Painting and Muſic 'till they grew old, from the Accidents attending which, ſuppoſe them (as a great many other People) to be very free; might we not then have juſtly expected from them even greater Wonders than they had ever before perform'd? I won't ſay that an *old* General is fitter to be truſted than a *young* one; or that the late *Mareſchal Schomberg* at his Death was a better Soldier (notwithſtanding his Age) than the preſent Kings of *Sweden* and *Poland:* but rather, that the Study of *Divinity*, or of the *Laws*, do ſeem as nice and large as thoſe of *Painting* and *Muſic*. Now the *old and ſage* Men of thoſe Profeſſions are every-where moſt regarded; *they* are found to have the ripeſt Judgments, and they are deſervedly employed in the moſt weighty Affairs appertaining to their Profeſſions. And it has been ſeen (as was partly ſaid before) that ſome *Painters* and *Muſicians* have not at all fail'd as they grew old, but kept that great Reputation to the laſt, which they had before acquir'd.

My Lord, upon the whole, it ſeems to me that there is a gradual and ſenſible Alteration in the Appearance of Things, and eſpecially in the Scripture or Hand-writing of MSS. Now theſe ought to be conſider'd with reſpect to the particular *Places* wherein they were written.

Every Country is ſuppos'd to have remaining in it the greateſt Variety and moſt conſiderable Monuments of its own Characters, unleſs they are known to be carried away to other Places. And therefore, if any Man be deſirous of conſidering the Letters of any Language that has been confin'd to any one particular Region or Province, 'tis but going thither, and it's ten to one, but (if he be diligent) he may ſatisfy his Curioſity very well. For Example: Suppoſe I ſhould be willing to conſider the Nature of the *Iriſh Letters*, their Original, Progreſs and Variations, with their Relation to the *Roman*, *Franco* and *Anglo-Saxon:* This might be done by travelling *Ireland* principally, by taking a Trip into the *Scotch Highlands*, and perhaps into the *Iſle of Man*, and by conſulting ſome *Engliſh* and *other* Libraries, whither ſome *Iriſh MSS.* have been carried.

If I would conſider the *French*, *Italian*, *Spaniſh*, or *Engliſh* Hands, each Country affords ſufficient Helps. But if a Man would conſider the Letters of a dead or living Language, which *ſpread far, and has been, or is uſed in ſeveral Countries*; he can't be ſuppos'd a perfect Maſter in all the Ways of writing that Language, till he has conſider'd the whole State and Succeſſion of its Letters in each of thoſe Countries: Amongſt thoſe Languages I reckon the *Hebrew*, *Arabi* *Turkiſh*, *Armenian*, *Perſian*, *Greek*, *Latin*, *Teutonic*, *Sc'avonian*, And though *Latin* is common amongſt us, and every body is pron cing the Age of a *Latin* MS. yet I think they would do well to inqu *where*, as well as *when*, a Book was written. And if they are cert that ſuch a *Latin* Book was written in ſuch a particular Country, Province, 'tis then more eaſy, by conſidering the Succeſſion of Lett uſed in that Province, or by comparing it with other Books writt

therei

therein, to ſay *how old* it is. For want of this Conſideration many learned Perſons have been almoſt always out in their Calculations, and have pronounc'd at random. If then, my Lord, this Method appears rational, and even neceſſary, in order to attain a ſufficient Meaſure of this ſort of Knowledge; it follows, that 'tis no eaſy matter to aſſign the Age even of a *Latin* MS. no, not even in *England*, where yet I ſuppoſe there may be as great a Variety of *Latin* Hands, as in moſt other Countries.

As for *Painting and Muſic*, they are Arts that I have always had a great Love and Affection for. I know very well that each Painter's *Hand* and each Muſician's *Manner* differs from another; but whether there is a gradual and remarkable Variation from themſelves in the Courſe of their Lives, is what I never heard aſſerted. This is certain, that they can *change* their Way of Painting and Compoſing at pleaſure; and therefore, Mr. *H. Purcell*'s *Dulcibella* is ſaid not to be like his other Muſic; and Mr. *Fuller* the Painter could put one of his Pieces upon Sir *Peter Lely* for a moſt incomparable Picture of *Mich. Angelo*. But then theſe Changes and Variations from their uſual Manners are *very* ſeldom made. And a Man generally purſues and practiſes that which is moſt agreeable to his own Genius. For this Reaſon, when a Painter's *Hand* is fix'd, his *Manner* is then limited; and ſo when a curious Perſon comes into a Gallery, he knows that *this* Picture was done by *Ryley*, *Kneller*, *Vandyke*, *Dobſon*, *Tintoret*, &c. and *that* to be a Copy after *Reubens*, *Georgeon*, *Salv. Roſa*, *Han. Caraccio*, *Pietro di Cortona*, &c. When he comes to an *Opera*, to a *Concert*, or to *Church*, not knowing beforehand what Muſic is to be perform'd; yet he may ſoon diſcern that it was compos'd by *Corelli*, *Baptiſt*, *Baſſani*, *Chariſſimi*, *Blow*, *Purcell*, &c. And ſo upon reading an ancient Author, a ſagacious and learned Perſon may find, that he writes according to the Manner of ſuch an Age, that the Stile imitates ſuch another; or that the Book, tho' it bears ſuch a Man's Name, yet might, perhaps, be more truly aſcribed to another, with whoſe Stile it more exactly agrees. As for Example; that Piece of S. *Cyril*'s, publiſh'd from the *Eſcurial* MS. by *Barthaſar Corderius*, is thought (by reaſon of the Analogy in point of Stile) to be *Origen*'s; but then, whether *all this* can *be always done*, *done eaſily*, and *without Errors*, is the Doubt. And it ſeems yet a greater Difficulty certainly to diſcover *how old* the *Painter*, *Muſician*, *Poet*, *Orator*, or other *Author* was when he finiſh'd any one Piece of his Works, unleſs a Man is plainly told ſo: this being a ſort of Knowledge, that thoſe who have been herwiſe ſufficiently experienc'd in their ſeveral Arts and Profeſſions, ve not as yet pretended to.

1.] At *Haerlem*, I obtain'd the Sight of the *Firſt* Book print- by *Coſterus:* It was not *Donatus*, as the *Inſcriptiones Hollandicæ* ſay; *Virgil*, nor *Tully's Offices*, as others have acquainted the World; but *Dutch* Piece of *Theology*, printed on one Side only of the Paper; and

Printing *invented by* Coſterus, *in* 1430. *by Mr.* C. Ellis. *n.*286.*p.*1416.

after this is a ſingle *Page* of *Latin*, entitled, *Liber Vitæ Alexandri Magni*, which made ſome believe it to be *Q. Curtius*, but it is a Monkiſh *Latin* of that Time. *This* and the *Theology* were printed in the Year 1430; whereas the *Inſcriptions*, and ſome other Authors have told us from *Coſterus*'s Picture, that Printing was by him invented but *Anno* 1440. But a Picture of *Coſterus* before another *Dutch* Piece (bound up in the ſame Volume, and printed 1432) bears the Date of 1430, under which Picture is the *Inſcription* mention'd by Mr. *Ray* (only the Date is *Ten* Years ſooner) and the *Tetraſtich*, which is tranſcrib'd by the Author of the *Inſcriptions* from an *Effigies* of *Coſterus*, which was then extant in a Garden at *Haerlem*, but is not now to be found.

Of the Invention *and* Progreſs *of* Printing *to* 1465. *by* ——. *n.*228. *p.*1507.

2.] What Mr. *Ellis* ſays about the Books printed at *Haerlem* by *Laur. Coſter*, agreeing ſo well with the Account given by *Theodore Schrevelius* and others, leaves us little or no room to doubt (who muſt needs take it for granted, that his Obſervation is accurate, and the *Dates* to be true) whether the Honour of the Invention be due to *this* or the other Cities, whoſe Writers have ſo eagerly contended for it; ſince none of them have pretended to ſhew any Book printed ſo ſoon as *A. D.* 1430, or 1432, or near that Time. But the Difficulty lies either in ſhewing, why the Practice of this Art ſhould be at a Stand from *A. D.* 1432, to the noted reviving of it at *Mentz* by *John Fuſt*, and *Peter Schoeffer*, who (as it has been vulgarly, but erroneouſly ſaid) did print the firſt printed Book there *A. D.* 1465, namely, *Tully*'s *Offices*: Or elſe, in giving any tolerable Account of the Progreſs of this Invention, during an Interval of above 30 Years.

Boxhornius (as I remember) as well as *Schrevelius*, and other Authors, do expreſsly ſay, (and if they had not, it might well be imagin'd) that *Coſter* could not advance this Invention ſo far, as to print ſo large a Work as the *Speculum Salutis* without gradual Improvements; and that his firſt Eſſays were on looſe and ſmall *Leaves* of Paper, before he attempted *whole Books.* Theſe being looſe and ſingle, are ſuppos'd to be all loſt: but I once obſerv'd a looſe Leaf of Paper *in Octavo*, lying in an old MS. *Breviary* in her Majeſty's Royal Library at *St. James*'s, which I then thought (and am ſtill of the ſame Opinion) that 'twas one of *Coſter*'s firſt Pieces; done when he had attain'd to ſome Experience in the Art, and to get Money. 'Tis a little rude wooden Cut of the five Wounds of our Bleſſed Saviour, and the Inſtruments of his Paſſion, with a *Latin* Inſcription at the bottom, to this Purpor- That thoſe who ſhould ſay ſo many *Ave Maria's* before it, ſhou have ſo many thouſand Years of Pardon. In this Cut or Print, t Ink which made it was *Writing-Ink*, and 'twas all black, without th other Colours with which *Coſter* ſeems afterwards to have ado his Books.

In the above-mention'd *Boxhornius*'s Book *de Origine Artis Typog. phicæ*, 'tis ſaid, that *Hadrianus Junius* had a Book printed by *Coſt*

and like that kept in the Cheſt at *Haerlem:* Now amongſt thoſe bequeath'd to the *Bodleian Library* at *Oxford* by Mr. *Francis Junius* (who was a Kinſman of *Hadrian's*) there is a thin Book in ſmall Folio (*Numbred* 31.) which may probably be the ſame; and which Mr. *Foſs*, a learned and curious *Daniſh* Gentleman, did aſſure me was very like to that at *Haerlem.* This contains the Sum of the *Hiſtory of the Old Teſtament*, all repreſented in rude wooden Cuts, colour'd with divers Colours, without *Shadows*, like to our *Cards*, (which, with *Sheet-Ballads*, are Remains of the old manner of Printing) and ſtamp'd upon one ſide only; the white ſide of two Leaves being paſted together; the Black both in the *Pictures*, and *Inſcriptions* which ſhew the meaning of them, being * *Writing-Ink*, (as the aforeſaid Leaf) inartificially ſpread upon the wooden Block; here thick, there thin; ſpreading and yellowiſh; the Letters extreamly rude, and altogether manifeſtly ſhewing that Art was yet in its Infancy. The ſtamping of this Book on one ſide only, was not (as ſome think) becauſe the *Printer* did not know how to diſpoſe the Pages in ſuch manner as might be proper and eaſy for the *Book-binder's* Uſe; for it has its *Signatures* all along in *Minuſcule Letters* (ſet in the Middle of the Page, which is remarkable) but becauſe it was thought that the Paper would not bear a ſecond Impreſſion on the Backſide; juſt as the *Book-writers* of thoſe Times (when Paper began to be cheap, and to be made up into Books) would yet have the firſt and laſt Leaf of each *Quaternio*, *Senio*, &c. to be of *Parchment* for Strength ſake. This Book (as I remember) is imperfect, and has no *Date* now appearing, and perhaps never had any; neither has ſuch another Book as this, which contains the *Hiſtory of St.* John *and the* Apocalypſe, in ſuch like wooden-colour'd Pictures and Inſcriptions. This is inſcribed *LAUDE 65.* in the ſame *Bodleian Library*, and has its *Signatures* alſo in *Majuſcule Letters* (as indeed I have obſerved *Signatures* in many MSS. of different Ages, as high as 1000 Years ago, and upwards, expreſſed either by *Letters* or *Numbers*). This Book, tho' printed on one Side, and paſted as the former, is yet more elegant, and ſhews that the Art was much improved. And here it may not be impertinent to obſerve, that in the ſame Library (*Arch. B. Bodl.* 88.) is an ancient MS. with the ſame *Fi*-
es and *Inſcriptions*, tho' the *Habits* of the Figures be different, thoſe
the MS. being of the older Faſhion, and 'tis very likely that there
nother Copy of this Book in the *Emperor's* Library at *Vienna*; for
mbecius, *Comment. de Bibliotb. Cæſ. Lib.* II. *Page* 772. reckons, amongſt
ſe which he brought away from the *Arcbiducal* Library at *Inſpruck*,
Book of which he gives this Account; *Apocalypſis S. Joannis Apoſtoli*
Evangeliſtæ Latino-Germanica, *chartacea in folio*, *una cum Vita ipſius*,
&

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* It is to be wiſh'd that Mr. *Ellis*, when he had *Coſter's* Books in his Hands, had obſerved whether the *Black Ink* was *Printing Ink* or not; whether *Coſter's* Picture was ancient, and coloured or not; or if there were more in either of the Books; whether the whole was cut upon Wood, or compos'd with *Printing Letters*; whether there were *Signatures* for the *Book-binders*, &c.

& multis Figuris Ligno inciſis, quæ propter Vetuſtatem ſuam ſpectatu ſunt digniſſimæ; and in this Book at *Oxford*, beſides the printed Cuts, alſo a *Commentary* upon the *Apocalypſe* in *High-Dutch*. Beſides theſe two moſt ancient printed Books, Mr. *Bagford* told me, that in the *Manuſcript Library* of *Corpus Chriſti* or *Bennet College* in *Cambridge*, he ſaw a third, containing the *Hiſtory of our Saviour*, printed on one Side only of the Paper, with ſuch like wooden Cuts; but yet more neatly than either of the former, which I had before ſhewn him at *Oxford*. And theſe three Books, being as is before ſaid, ſtamped but on *one Side* of the Leaf, the whole *wrought* or *cut upon Wood*, not *ſet* or *compoſed* with *Printing Letter*, and printed with *Writing-Ink*, do ſufficiently demonſtrate, that the Art was as yet in its Infancy, and may, tho' they bear no Workman's Name, be very reaſonably aſcribed to *Coſter*, not only becauſe no-body elſe lays Claim to them, but becauſe in divers Circumſtances they agree with the Hiſtory of the Man, and with what remains of his Workmanſhip. If it be aſk'd, why *Coſter* did not ſet his Name, and the Year to theſe Books, as well as to that at *Haerlem*, mention'd by Mr. *Ellis?* It may be anſwer'd, that *Schrevelius* tells us, that *Coſter* bound *Fuſt* above-mention'd by Oath to Secrecy, and not to betray the Art to any Perſon whatſoever. Wherein 'tis likely, that his Deſign was not ſo much to let the World think, that he had a new Way of multiplying the Copy of a Book much quicker than the quickeſt Penman; but that he deſign'd to impoſe upon the World, by ſelling his *printed Books* for new-written Copies, whereby the *Book-Writer* and *Illuminator* muſt (as he might well pretend) be ſo paid for their Work, as to maintain themſelves and Families. This Trick might be long undiſcovered in and about *Haerlem*. becauſe there was no other Printing, whereby this might be condemned; but at length, as *Boxhornius* and *Schrevelius* write, *Fuſt* run away with all his Maſter's Tools and Materials, and in proceſs of Time ſet up a Printer's Shop at *Mentz*, being aſſiſted by his Servant *Peter Schoeffer* (a young Man of a good Genius) who afterwards married his Daughter, and became his Partner in the Buſineſs. The Story goes, that this *John Fuſt* went to *Paris*, (but whether before or after his ſettling at *Mentz*, I cannot tell): And that he there offered a great Number of *printed Bibles* to Sale, as if they were *Manuſcripts*. But the *French* were not to be ſo caught. They conſider'd the Number of theſe Books, and their exact Conformity to one another throughout the whole, to a Line, a Word, a Letter, a Point, and that the beſt of *Book-Writers* could not be thus exact; and therefore by indicting him of *Di* *lical Magic* (or threatening him with it) they at once gave Birth the Story of *Doctor Fauſtus*, and cauſed him to diſcover the A And I doubt not but about this Time very many Books were prin ed and ſold for Manuſcripts, I having ſeen divers ſuch Books wi out Dates, which look'd rather older than any I have ſeen with th I ſpeak now of thoſe that are ſet or compos'd of *Letter*, which, wi

Printing-Ink of Lamp-black and Oil, and the *Printing-Preſs*, is ſaid to be the Improvement of *Schoeffer* above-mention'd; tho' *Schrevelius* with leſs Reaſon aſcribes the two former to his Countryman *Coſter*.

When *Fuſt* and *Schoeffer* began firſt to work at *Mentz*, is uncertain; but the firſt Mention I find of him, as a Printer at *Mentz*, is in *Schrevelius, Haerlem*, pag. 272, where he ſays, that this *Fuſt*, (or *Fauſtus*, as he calls him) publiſh'd *Alexandri Doctrinale cum Petri Hiſpani Tractatibus*, A. D. 1442. but this, and ſome other Books mentioned by Writers on this Subject, are never ſaid to be extant in any *particular Place*, in order to be *conſulted* upon Occaſion; and therefore their *Titles* and *Dates* are not ſo much to be relied upon. But another Date, which, tho' not ſo *old*, is more *authentic*, may be found in the above-cited Book of *Lambecius*, pag. 989. where he ſays, he brought away from *Inſpruck*, amongſt other choice Volumes, and placed in the *Imperial* Library at *Vienna*, a Pſalter printed upon *Parchment*, with this Inſcription at the End; *Præſens Pſalmorum Codex Venuſtate Capitalium decoratus, Rubricationibuſque ſufficienter diſtinctus, ad inventione artificioſa imprimendi ac characterizandi, abſque Calami ulla Exaratione ſic effigiatus, & ad Euſebiam Dei induſtrie eſt conſummatus per* Johannem Fuſt, *Civem Moguntinum, &* Petrum Schoeffer *de Gernſzheim, Anno Dom. milleſimo* CCCCLVII. *in Vigilia Aſſumptionis.* From this Time there are conſtant Remains of the Induſtry of theſe Men; and I can mention more Books printed by them, than the *Durandus* (in the Library of *Baſil* in *Switzerland*) printed (as a Gentleman, who ſaw it, told me) *A. D.* 1458. *Joannes Joanuenſis*'s *Catholicon* (in her *Majeſty*'s and the *Lord Biſhop* of *Norwich*'s Libraries) printed 1460. The *Latin Bible* of 1462, yet extant in the *French King*'s Library, and in divers Monaſteries beyond the Seas, and perhaps in *England*. The *Tully*'s *Offices* printed both in 1465 and 1466. (if both theſe be not the ſame Edition, the *laſt Sheet* or *Leaf* being compoſed afreſh): and ſo on till *Schoeffer* work'd for himſelf after the Death of *Fuſt*, and *Schoeffer*'s Poſterity after him. But I willingly forbear the Catalogue, in hopes that this, with that of the other *old Printers* throughout *Europe*, and eſpecially of our *Engliſh Workmen*, with their *Devices*, the *Effigies* of moſt of them, and a multitude of uncommon Remarks relating to *Writing*, *Printing*, *Parchment*, *Paper*, *Binding*, &c. will be communicated to the World, when Mr. *Bagford*'s Papers ſhall be digeſted.

I add alſo, that upon the firſt Diſcovery of the Art by *Fuſt* at *Paris*, at his firſt Settlement or publick Profeſſion it at *Mentz*, it quickly ſpread over the t Parts of *Europe*, * and was commonly ſed in *other Countries* before 'twas known in *ngland*, (notwithſtanding what ſome Writers affirm to the contrary;) the firſt Book, that pretend to have been printed here, being *ierome* (or rather *Rufinus*) on the *Creed*, printed at *Oxford*, *A. D.* 1468.

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* From theſe *Places*, and from *Books*, or Parts of *Books*, where, or wherein ſuch Sorts of *Letter* were uſed, the *Printers* do ſtill call their *Letter*, *Italick*, *Roman*, *Engliſh*, &c. *Auſtin*, *Canon*, *Pica*, *Primer*, *Brevier*, &c.

To prove this in ſome meaſure (not to mention the Progreſs of *Printing* in other Countries) I inſtance in *Italy*, and particularly *Rome.* Here, not to inſiſt on the large Catalogue of *printed Books* deſcribed in an Epiſtle to Pope *Xyſtus* IV. publiſh'd at the Beginning of the fifth *Tome* of the *Bible* printed with *Lyra's Commentaries* at *Rome*, A. D. 1472. and tranſcrib'd by *Boxbornius*; I ſhall only relate the Sum of what I meet with in *Bernard Montfaucon's Diarium Italicum, Tom.* 1. *page* 255, 256. 'Tis, that *Joannes Alerienſis, in a flattering Epiſtle to Pope* Paul II. (who was elected *A. D.* 1464.) *congratulates him, becauſe Printing was firſt uſed at* Rome, *under his Pontificate.* Which if ſpoken of the very firſt Practice of the Art at *Rome*, and not of an eſtabliſh'd Imprimery, ſeems to be falſe; becauſe this learned Monk, in the ſame place, ſays *he ſaw a Lactantius in the Muſæum* (or Study) *of Monſieur de la Thuilliere, which has theſe Words at the end*; *Lactantii Firmiani Inſtitutiones cauſæ in venerabili Monaſterio Sublacenſi Anno* 1461. *antepenultima Octobris.* Now unleſs a Man will ſuppoſe Printing to be invented in this Monaſtery, he muſt believe it to be brought hither from *Rome.* which is but about 20 Miles diſtant from it. And the ſame Author ſays, *that Floravantes Martinellus, in his Roma Sacra, affirms that Printing was practiſed at* Rome *in the Palace of the* Maximi, *A. D.* 1455. *under Pope* Nicolaus V. *by* Conrad Sweynheim *and* Arnold Pannartz, who were both *Germans*, and continued *Printers* there for many Years after.

The Cuſtom of putting the *Dates* of *printed Books* at the *End* of them, was taken up in Imitation of divers of the middle-aged and recenter Manuſcripts (for I never ſaw or heard of any ancient Manuſcript in *Capital Letters*, either *Greek* or *Latin*, which has a *profeſs'd Date* written in the *firſt Hand*; but here the Inſpector ought to be cautious, leſt he be led into an Error: For ſeveral Manuſcripts at the End have a Date, which may be by ſome underſtood of the Time when thoſe individual Copies were *written*, whenas they only notify the Time when the *Author finiſhed his Work*. And ſome of theſe Dates, being printed from the Manuſcripts, have deceived many curious Men. For Example, the firſt Edition of *Lynwood*, *Paulus a Sancta Maria*, and others which I could name. Beſides ſome Dates in ancient printed Books, being not Corrected, are falſe; ſuch as a Book printed in the beginning of the 16th Century, in the Library belonging to the *Aſhmolean Muſæum* at *Oxford*, which thus pretends to 400 or 500 Years of Age. A *Julius Hyginus* once ſhewed to me by M *Millington* the Bookſeller, printed at *Paris* (as there put down) *Ann Dom.* MCCCCXII. inſtead of MCCCCCXII. For the Printer is mention'd as then living in *l' Origine de l' Imprimerie de Paris.* I have indeed a Book, wherein, amongſt other Tracts, is one of an old Print, at the end of which there ſeems to be ſuch a Miſtake, tho' not ſo eaſily rectified as the former. The Words are theſe; *Explicit Opuſculum* Enee Sylvii *de duobus amantibus in Civitate Leydenſi Anno Do-*

min

mini Milleſimo CCCC *quadrageſimo tertio* LEIEN. Now tho' *Leyden* ſeems to be the Place *where* 'twas printed, yet 1443 cannot be the Time *when*; for juſt before *Sylvius* ſays himſelf, *Vale, ex Vienna quinto Nonas Julias Mo* CCCC *quadrageſimo quarto. Sylvius* was elected Pope by the Name of *Pius* I. *A. D.* 1458, and died *A. D.* 1464. Now it may ſeem probable, that if this Tract was printed after his Election (as ſuppoſe *A. D.* 1463.) or even after his Deceaſe, his Papal Dignity might have been remember'd; if it be judg'd to have been printed before his Election, I know none that will allow of printing at *Leyden* (or even in *Lyons*) ſo very early.

One Objection may be urg'd againſt what is ſaid of *Coſter's*, or the old printed Books above-mention'd, being printed upon Paper about *A. D.* 1430, or ſoon after. For ſome Authors are of Opinion, that Paper made of Linnen Rags was firſt made at *Baſil*, by ſome *Greeks* who fled out of their Country after the Saccage of *Conſtantinople*, *A. D.* 1452, in Imitation of the *Cotton Paper*, commonly uſed in the *Levant*. But this can have no Force, our Paper being much older: For I have a Piece, the Writing upon which ſeems to be about 350 Years old, and agrees very well with a Charter which I have ſeen of *Thomas Beauchamp* Earl of *Warwick*, bearing Date *A. D.* 1358, and 32 *Edw.* III. In the Archives of the Library belonging to the RR. Dean and Chapter of *Canterbury*, I ſaw an Inventory of the Goods of *Henry*, Prior of *Chriſt's* Church there, taken upon his Deceaſe (as I remember) the 20th Year of King *Edward* the IIId, and this is written upon *Paper*. In the *Cottonian* Library, though ſearching after other Matters, I could not but obſerve ſeveral Writings upon our *Paper*, in the Time of moſt of our Kings and Queens, as high as the 15th of King *Edward* III. and I doubt not but that there are others more ancient in the ſame Place. But in the *Eaſt*, the Uſe of *Cotton Paper* is much more ancient; and I have in the *Bodleian* Library ſeen an *Arabick* Manuſcript (amongſt thoſe which the Univerſity bought of Dr. *Huntingdon*) written in the 427th of the Year *Hegira*, i. e. *A. D.* 1049; and others in the ſame Place, without Dates, ſeem older.

The Proximity of the Subject cauſes me here to take notice, that though the Invention of the *Rolling-preſs* is commonly aſcribed to *Lipſius*; yet it ſeems older than his Time, from a printed Book in the *Bodleian* Library, placed LAUD. D. 138. This is a *Miſſale ſecundum uſum Eccleſiæ Herbipolenſis*, (i. e. *Wurtzburg* in *Germany*.) *Rodolfus*, Archbiſhop of that Church, ſets forth in an Inſtrument at the Beginning of the Book, the Reaſons why he cauſed this Miſſal to be publiſhed, which Inſtrument bears Date the 8th of *November* 1481; by which Time he orders all the Copies to be finiſhed by *Jorius Ryſer* his Printer, who ſeems to have done ſo, ſince his Name, and this Year 1481, is written at the End of the Book. Inſtead of a Seal to this Inſtrument is an *Engraven Print*, being the *Arms* of the *See* ſupported by two Angels, and St. *Kilian* (its firſt Biſhop and Protector) behind; as alſo

alſo this Prelate's own Arms, with thoſe of the *See* in another *Eſcutcheon*, and a very fine *Mantling*. This is extremely well engraven for the Time, and equals the Performances of ſome of our beſt Workmen at preſent. The evident Marks of *Preſſure* by the *Plate*, with ſome Touches of *Ink* at the *Edges*, the *Roughneſs* of the Print, and other Circumſtances concurring, I thought this muſt needs be wrought off at the *Rolling-preſs*. But being unwilling to rely too far upon my own Judgment, I ſhewed it to divers very knowing and curious Gentlemen, to ſeveral *Printers*, *Engravers*, and others working conſtantly at the *Rolling-preſs*, who all concurr'd (though at different Times, one not knowing what another had ſaid) that 'twas not only excellently well engraven (and this before *Albert Durer's* Time) but that it was certainly pull'd from the *Rolling-preſs*, and could be done no other way. And that this Print was not done after that Time, appears from ſeveral Notes written here and there in the Book. One of them ſpecifies that *William Kewſth*, Vicar of St. *Bartholomew's* Church in *Wurtzburg*, bought this Book the ſame Year 1481, paying 18 *Florins* for the *Parchment*, *Printing*, *Rubrication*, *Illumination*, and *Binding*. By another it appears, that he gave it to his Church for ever. And by ſome others it appears that it remained there during the Times of his ſeveral Succeſſors, till the laſt Age, when, as I ſuppoſe, the *Swedes*, under *Guſtavus Adolphus*, plunder'd the Church, and brought it out.

On the ſame, *by M.* J. Bagford. *n.* 310. *p.* 2397.

3.] The Antiquity of Printing, and the firſt Inventors, having been treated of by many Authors, I ſhall now only give a ſhort Account of the Obſervations I have made in many Years from old Books of ſeveral Sorts and Kinds. The general Notion of moſt Authors is, that we had the Hint from the *Chineſe*; but I am not in the leaſt inclined to be of that Opinion, for at that time of day we had no Knowledge of them. I think we might more probably take it from the ancient *Romans*, their Medals, Seals, and the Marks or Names at the Bottom of their ſacrificing Pots, which Antiquities we had amongſt ourſelves in *Europe*, rather than fetch it ſo far. But if it be certain, that Cards are as old as our King *Henry* the VIth, nothing that I have ſeen, or conſidered of, ſeems to give ſo fair an Hint for Printing, as the making of Cards; as it is evident by the firſt Specimen of Printing at *Haerlem*, and by ſome Books in the *Bodleian Library* at *Oxford*, one in *Junius's* Collection, another in Archbiſhop's *Laud's*, and a third in the ſame; being the Lives of the *Ruſſian* Saints in a thin Folio; the Leaves are not paſted together as the former two, but cut on wooden Blocks, and illuminated. There is alſo another rare Specimen of the firſt in that valuable Collection of Archbiſhop *Parker* in *Bennet* College Library at *Cambridge*, bound up with a MS. Book. This was ſhown me at firſt by Mr. *Bullord*, and differs very much from them at *Oxford*; it is the *Life of Chriſt* in Figures, or rather the Types of the Old and New Teſtament. They have not ſo many Specimens of the firſt Printing at *Haerlem*, as we have in *England*; and I am apt to believe, that if ſome curious Perſons had the Liberty of looking over the Libraries in both Univerſities, and that of the Royal Society, there might be found other Specimens of the ancient Printing: the aforementioned Books being taken notice of but of late.

The cutting of the Moulds or Blocks for making our playing Cards, is after the ſame Manner as thoſe for the Books printed at *Haerlem*. They lay a Sheet of moiſt or wet Paper on the Form or Block, being firſt lightly bruſh'd over with Ink, made of Lamp-black mix'd with Starch and Water: Then they rub it off with a round Liſt with their Hand, which is done with great Expedition; this is for Picture or Court Cards: Then they paſte them together threefold, the coarſeſt in the middle. They colour them by the help of ſeveral *Patterns*, or *Stanefiles*, as they call them; they are Card Paper cut through with a Penknife, for every Colour, as Red, &c. (for at the firſt Printing the Card has only a meer Out-line:) Theſe Patterns are painted with Oil-Colours, to keep them from wearing out with the Bruſhes; they lay it upon the Picture, and by ſliding a Bruſh that is full and looſe gently over the Pattern, it fixes the Colour into the cut Holes, and leaves it on the Print that is to be a Card, and ſo go through all the Colours you ſee on Cards; but this cannot be ſo well underſtood by a Deſcription, as by ſeeing them perform it. This I humbly conceive to be their Way of printing firſt at *Haerlem*, and thoſe Books above-mentioned. This, methinks, might have been conſider'd before this time of Day, if they would have put themſelves to the trouble of inſpecting the old MSS. 900 Years old; for the great Letters are done by the Illuminators the ſame Way as Card-making; as I ſhall treat of more at large in another Diſſertation.

The next Form of Printing at *Haerlem* was by cutting whole Forms in Wood from MSS. exactly written, and without Pictures: Such I take the *Donatus* to be, mentioned in Hiſtories; and this might bear Date in 1450, ſome ſay 1440. This may be as plainly demonſtrated, as the former, from Copy-Books which we have ſeen printed at *Rome*, *Venice*, *Switzerland*, and *England*, as high as 1500; and, if I miſtake not, there is a Block cut in Box in the Collection of the *Muſæum* of the Royal Society. This Writing is harder to perform than either the *Roman*, *Italick*, or any other Letters uſed in printed Books.

The third Way of Printing was with ſingle Types made of Wood, but to whom the Honour of the Invention is due, is not very evident; it was then eſteemed ſo great a Rarity, that the Printers carry'd their Letters in Bags at their Backs, and got Money at great Mens Houſes by printing the Names of the Family, Epitaphs, Songs, and other ſmall Pamphlets.

The fourth Improvement of this noble Art was the Invention of ſingle Types made of Metal. Here we muſt entirely give the Honour to *Peter Schoeffer* of *Grenſchen*, Servant, and afterwards Son-in-law to *Fauſt*, who entertain'd him to work in his Houſe at *Mentz*: He obſerving how induſtrious his Maſter was every Day to improve this Art, undertook it himſelf; and with much Study and Induſtry brought it to Perfection. After he had made ſeveral Eſſays, at laſt he ſhews it to his Maſter *Fauſt*, who having tried ſome Experiments with his new-invented ſingle Types, finding that it would anſwer his Expectation, was ſo tranſported with Joy, that, for his Reward, he promis'd he ſhould marry his Daughter, whoſe Name was *Chriſtian*, which ſome time after he perform'd, and continu'd together improving this Art with great Secreſy, till it became known, and ſpread itſelf over all *Europe*. Sometimes you have their Names to the Books they printed at the End, and ſometimes not; ſometimes with Dates as high as the Year 1457, as the Pſalms printed by them, now in the Emperor's Library, which *Lambecius* mentions in his *Bibliotheca*, and as low as the Year 1490; and for this we have the Authority of *Eraſmus*, in a Preface to *Livy*, printed at *Baſil* by *Froben*, in 15..

As for *John Guttenburgh*, though by abundance of Authors he is ſaid to be the firſt Inventor of Printing, we cannot find one Book with his Name and Printing.

We may rationally conjecture, that Printing with Plates of Pewter, Braſs, or Iron, either graved or eat with *Aqua fortis*, was firſt practis'd by the working Goldſmiths; for they have a Way of taking off the Impreſſions of their Work by the Smoke of a Lamp, which perhaps gave the Hint to the Graving on Braſs. We have a dark Story of it in ſome Authors.

Having treated of Printing, to ſatisfy the Curious, I ſhall ſay ſomething of the ſeveral Advances and Improvements it hath received.

The *Haerlem* Printing at firſt was a Book with Pictures; they took off the Impreſſion with a Liſt coiled up, as the Card-makers uſe the ſame to this Day.

But when they came to uſe ſingle Types, they made uſe of ſtronger Paper, with Vellum and Parchment: Then they made uſe of a Preſs, although they afterwards contrived and made it more uſeful.

Neither was their Ink for Printing brought to Perfection at the firſt, but improved by degrees.

Rolling-preſs Printing was not uſed in *England* till King *James* I. and then brought from *Antwerp* by our induſtrious *John Speed*.

Of his intended Hiſtory *of* Printing.

I ſhall diſcourſe at large, in my *Hiſtory* of *Printing*, of the Invention of making Paper in *Europe*, from all the beſt Authors, with large Obſervations of my own; the Time when it began in ſeveral Places, more eſpecially in *England*; and I intend to exhibit a Specimen of the Marks of the old Paper, which has not yet been attempted by any.

Book-binding ſhall be handled in all its Parts, its ſeveral Ages and Times: Alſo the Form, Size, and Volume, Folding, Sewing, Head-banding, ſeveral ſorts of Boards for Covers, Claſping, Boſſing, &c. Alſo in all Countries, as *China*, *Perſia*, *Turkey*, *Greece*, Ancient and Modern *Germany*, *Italy*, *France*, *Holland*, and *Spain*; *but* more particularly in *England*.

The Devices, *Rebus's*, and Signs of the ancient Printers will take up a whole Chapter, where their Deſcent and Genealogies ſhall be ſhewn, and how they ſucceeded one another in their Office, or Printing-houſe. On this Subject I have no Path to follow; but *Draudeus* hath a Tract I find mentioned, that treats of the ancient Devices of the Printers: but after my Inquiry, I could never ſee it, and ſo can receive no Aſſiſtance from it. Alſo *Naudeus's* Life of *Lewis the Eleventh* hath an Account of *Fauſt's* printing the Bible in the *Latin* Tongue, his bringing them to *Paris*, and vending them there for MSS. his Troubles and Accuſations before the Parliament, being tried for a Conjurer, which I conceive gave Occaſion for that fooliſh Book, that goes under the Name of Dr. *Fauſtus's* Life. This is not my own Thought, but the Sentiments of others; for we have another Example of the like nature, our famous *Roger Bacon*, though ſome Centuries of Years before, who had the like Fate.

Since my ſecond Voyage to *Holland*, to ſatisfy my Curioſity, and remove ſome Scruples about the Book at *Haerlem*, and the Statue of *Coſter*, having recollected myſelf after my firſt Voyage, and diſcourſing with Mr. *Talman*, jun. about *Holland* and the Statue of *Coſter*, he told me he had ſeen the ſame in *Holland*, and that it was in the *Haerlemer-ſtreet* in *Leyden*. This very much run in my mind, to be further ſatiſfied that it ſhould be in *Leyden*, and not *Haerlem*, altho' aſſerted by ſeveral of our modern Travellers.

At my laſt being in *Holland*, for my further Satisfaction, tho' I had got Mr. *Ball* to take the Inſcription for me the Year before, in *June* 1705; on the 23d of *October* 1706, I took Boat for *Leyden*, where I arriv'd about ſix the ſame Day; and next Day in the Morning, in the Company of Mr. *Bovell*, a Student there, who was my Guide into the *Haerlemer-ſtreet*, ſo call'd becauſe it leadeth to the *Haerlem* Parts, over the Door of a Glazier's Houſe was the Figure of *Coſter* cut in Wood, and painted with the Inſcription.

This Statue was not ſet up by any publick Authority of the Magiſtrates of that City, but by a private Man; and, if I miſtake not, by the Owner of the Houſe, perhaps for the Name and Sake of the Street; and, as I ſuppoſe, not older than about 1630. This Statue is done after the graved Print that is in the Book at *Haerlem*, or the Painting over the Door of *Laurence Johnſon Coſter*, where they ſay he firſt practis'd the *Art of Printing*; but I rather take it, that he liv'd in this Houſe in his old Age, and was Church-keeper, or, as we call it, *Sexton*; for ſo the Word ſignifies both in the *German* and *Dutch* Language.

Some Days after, leaving *Leyden*, we ſet forth from *Amſterdam* in a Waggon for *Haerlem*, to compare and collate the Book which Mr. *Bullord* had procured for me with that at *Haerlem*, it being another Impreſſion in *Quarto*. The Name of the Book at the latter end runs thus:

> *This Book was finiſhed in the good City of* Culenburgh, *by me* John Veldener, *in the Year of our Lord* 1483, *on the* Saturday *after St.* Matthew'*s Day*; with the Device of the Printer hanging on the Bough or Snag of a Tree, a Cuſtom they much uſed in thoſe Days, as may be ſeen by the Monuments of the Ancients cut on Grave-Stones, not only in the great Church at *Haerlem*, but ſeveral other Cities in *Holland*.

The Title of the Book in *Low-Dutch*, the Language in which it is printed, is,

De Spiegel onſer Behondeniſe.

In ENGLISH,

The Mirror of our Salvation.

When we arrived at *Haerlem*, much to my Surprize we found the Houſe of *Coſter* new fac'd with Plaiſter, and the Picture of his Statue, (for it is no other than a Picture in Oil-Colours) painted on a Board let into the Wall near the Top of the Houſe, although it be a ſmall one. This Houſe was new repair'd, and to be let; although when I was there before, it was inhabited by a Cheeſemonger. After viewing the Houſe and the great Church, we directed our way to the Rector, who is the School-maſter, put in by the Magiſtrates of the City. He not being in the way, his Servant-Maid took the Key, and readily gave us Admiſſion into the Prince's Garden, in order to ſhew us the Book, which was removed from the Stair-head of the Prince's *Houſſe*, or Houſe, where we ſaw it laſt, to the further End of the Garden, in a little Houſe fitted up for that purpoſe, facing the Garden. On the Cheſt that it was kept in, there was the Date 1618, inlaid in the Wood. Opening it, the Maid ſhewed us the Book, where Mr. *Bullord* collated it with the other we brought with us from *Amſterdam*, and found it to agree both in the Words of the Text, and alſo the Pictures; they only differ'd in this, that being in *Folio*, with two Pictures in a Page, and the Words Column-wiſe, and 25 Lines in a Column, containing 60 Pages, and printed but on one ſide, and not paſted together as thoſe at *Oxford* and *Cambridge*.

This will enable me to oblige the Curious with a Specimen of the *Haerlem* Book, as well as thoſe of *Oxford* and *Cambridge*; the latter I have cut for my Hiſtory of Printing, as I do intend the others.

After this, we addreſs'd ourſelves to an old Gardener that was at work in the Garden; for Mr. *Bullord* had enquired of him when we came firſt into the Garden, Whether he knew any thing of the Statue of *Coſter?* And he readily told him, he could ſhew him it. At the Entrance into the Garden, at the upper End of the Summer-Houſe, on the right Hand, he pointed to it, where we ſaw it leaning with its left Hand on the Inſcription, which bore Date 1440. and in its right Hand the Letter A in a Square, with other Figures, as little Boys naked, and in their Hands ABC, with the Picture of *Fame* holding the Letters CD and E. This was taken from the Story of *Junius*, in his *Hiſtory of the Low Countries*, and others from him. There are other Stories painted on the Walls of the Summer-Houſe, as one of the Lords of *Haerlem* in his Armour; but they not being to my purpoſe, I ſhall paſs them by.

All theſe Pictures, with the Statue of *Coſter*, are painted in *Diſtemper*, and are no older (as appears by the Date on the Cieling) than 1655.

This is a ſhort Account of my ſecond Voyage into *Holland*, and the Advantages I have gain'd by it, in collating the ſo much eſteemed Book by the *Hollanders*, which ſeems to me not ſo rare as at firſt, ſince I have had a Sight of that at *Bennet College* in *Cambridge*, and thoſe at *Oxford*; which will alſo enable me to give a further Account than hitherto hath been done, by the help of ſome Books that have been procured me by my Friends Intereſt, as that of *Naudeus's* Story of Printing in the Life of *Lewis* XI. in Mr. *Bayle's* Collection, procured me by Mr. *Leers* of *Amſterdam*, who got the Favour for my Friend Mr. *Bullord* to tranſlate that Part which relates to the Hiſtory of Printing, the Story of *Fauſt*, &c. and the firſt Printing at *Paris*, as well as at *Mentz*; this contains 16 Sheets in MS. with other critical Diſcourſes relating to Learning, and Books that were firſt printed. Theſe I have been in Search of for many Years, and am apt to believe there is never a one in *England*.

One Book more I want to ſee, and ſhould be extreamly ſatisfied if any one could procure me the Sight of it. It is a ſmall Tract wrote by *Draudius* in ſmall *Twelves*; *The Devices of the Printers*.

I have had the Chronicle of *Collen*, which *Naudeus* could never ſee, and alſo a Book printed at *Leipſwick* in the *German* Language, giving an Account of the *Jubilee* kept there in Memory of *Printing* and its Invention, tranſlated into *Engliſh* by my Friend and Correſpondent Mr. *Bullord*, with many other Tracts relating to the firſt Invention of *Printing*.

I have ſpared for no Coſt or Pains in procuring of Copies of Books, where they are to be had, for the illuſtrating it in all its Parts, to ſatisfy the Curious. Now as *Printing* itſelf is but another way of Writing, and brought to Perfection by degrees, as other Arts; and as Pictures either painted, cut in Wood, or graved, were called the

Lay-mens Books; for every one could read a Picture, and ſay this is an Houſe, and that a Tree; ſo I may ſay, that the Pictures, or Drawings of the Ancients, gave the firſt Hint of *Printing:* And if the Scribes in proceſs of time had not brought their *Art of Writing* into the Decorum and Uniformity, and Rule in their ſeveral Volumes, the *Printers* could not have followed them ſo exactly in the Imitation of their Letters and Pages of their Books. Pictures firſt were thoſe of Devotion; then the making of Cards was another Introduction to the Invention of *Printing:* The making of Cards I take to be very ancient.

For the firſt Specimen of *Printing* was on one ſide only, as that at *Bennet-College*, moſt in Figures, with ſome few Words only on the ſide in Labels, like that at *Oxford.*

The next Step is that Book at *Haerlem*; the Deſigns of the Prints are better perform'd; and then they came to have not only Lines, but whole Pages of Words, beſides the Pictures on a Page.

The next Step was *Ballad-printing*, with the like Pictures, and them but on one ſide.

The next Improvement of this noble Art was the cutting of whole Pages on wooden Blocks or Moulds, and printing on both ſides of the Page; and the firſt Specimen of this Nature was a *Donatus*, and, as Authors ſay, was printed at *Haerlem* and at *Mentz*, although ſome ſay a Bible was printed the ſame way 1457.

For the Hiſtory of making Paper here in *Europe*, I have, by the Aſſiſtance of my Friends in the *Tower* and elſewhere, been enabled to give a large Account of its Antiquity, almoſt two Centuries higher than I thought of, and ſhall give the Marks of the ancient Paper, from the 12th Century down to 1600, in the ſeveral Countries where the *Paper-makers* lived.

This, I am apt to think, was never attempted by any Author before. The Specimens of ancient Pieces of MSS. and alſo of ancient Paper, collected by myſelf ſome Years ſince, and bound up in two Volumes in large Folio, are now to be ſeen in the Library of his Grace the Archbiſhop of *Canterbury*, in *St. Martin's*, collected and put together at no ſmall Coſt and Pains; perhaps the firſt of that kind that ever was done in any Part of *Europe.*

I conclude with informing you, that in this Treatiſe I ſhall give an Hiſtorical Account of the ſeveral Verſions and Impreſſions of the *Holy Bible*, *Teſtament*, *Pſalms*, *Primmer*, and other Books of Devotion, from the Beginning of the *Reformation* down to 1600. At firſt I had no Thought to have inſerted them; but ſome Collections coming into my Hands of late, wherein I find ſeveral material Paſſages not mentioned by any that have gone before me, ſo amply and fully, I ſhall, for the Information and at the Requeſt of my particular Friends, treat of them in a diſtinct Chapter.

An Account of Mr. Bagford's *Collections for a* Hiſtory *of* Printing, *by Mr.* H. Wanley, *ibid. p.* 2407.

4.] Mr. *Bagford*'s Collection for his *Hiſtory* of *Printing* conſiſts chiefly of *Title Pages*, and other *Fragments*, put together into Books; many of them in ſome Sort of Order and Method, and others not. *Ex. gr.*

In one Volume there are Specimens of *Letters* of all ſorts, as well of thoſe uſed in foreign Countries, as in *England.*

In another, are Titles and Fragments of *Almanacks* from *A. D.* 1537, downwards; with Titles of *Bibles*, *Law-Books*, &c. Printed by the *Company of Stationers* in *London.*

In other Volumes are the Titles of Books of all kinds, printed by the *London Printers*, diſpoſed into ſome ſort of Order, *viz.* as to the Subject of the Book, or Dwelling-place of the *Printer.*

In others, are Title-Pages of Books printed in *Oxford* and *Cambridge.*

In others, Title-Pages of thoſe printed in *Scotland* and *Ireland.*

Title-Pages and Frontiſpieces, with other Specimens of the Works of our *Engliſh Engravers.*

Titles of Books printed by *Roman Catholicks*, *Preſbyterians*, *Quakers*; by other *Sectaries*, by *ſeditious Perſons*, &c.

Cuts of *Monuments*, *Tombs*, *Funerals*, &c. in *England.*

Cuts of the ſame in foreign Parts, with the Cuts of the Manner of *executing Criminals.*

Cuts with ſome Drawings of Habits of divers Nations, of ſeveral Trades, of *Utenſils*, *Weapons*, *Fountains* or *Wells*; with other Prints uſeful in *Joyners* and *Maſons* Work.

Cuts of Figures in different Poſtures, as *Writing*, *Reading*, and *Meditating*; with all the *Utenſils* uſed in *Writing*, *&c.* during ſome Ages. Cuts of *Schools.* The *Heads* of ſome *Arithmeticians*; *Alphabets*; Specimens of *Knot-work*, and ſome *Great Text* and other Letters. Specimens of *Letter-Graving*. *Heads* of Writing-Maſters, *Dutch*, *French*, *Engliſh.* Specimens of Letters engraven in *Small*; as alſo of *Short Hand*, &c. *Heads* of *Short-hand Writers*, and Specimens of their Works, and many other things.

Title-Pages of *Books*, and *Printers Devices*; printing in the *Spaniſh Netherlands*, *Spain*, and *Portugal*; Titles of Books publiſhed by *Engliſh Catholicks*, Alphabets of *Plantin*'s *Capital Letters*, &c.

Title-Pages, *Alphabets*, and *Printers Devices*, uſed in *Baſil*, *Zurich*, and in other Places in *Switzerland.*

The like for the *United Netherlands.*

The like for *France.*

The like for *Germany*, with ſome others of *Poland*, *Switzerland*, *Denmark*, *Bohemia*, and *France.*

The like for *Italy*, with ſome others of *Geneva*, *Sicily*, &c.

Collection of *Acts of Parliament*, *Ordinances*, *Proclamations*, &c. regulating the *Preſs*; with many other Papers.

Propoſals for printing particular Books.

Catalogues of Books, relating to *Painting*, *Printing*, &c. Specimens of Paper differently coloured. Marks on the Outſides of Reams of Paper; with *Orders*, *Caſes*, *Reaſons*, &c. relating to the *Manufacture*.

Old *Prints* or *Cuts* from *A. D.* 1467. with the *Effigies* and *Devices* of many *Printers*, *Foreigners* and *Engliſh*; with other *Cuts* and Specimens of *Paper*, &c.

Collection of *Epitaphs* of the *Printers* in *Baſil*; with the Life of *John Froben*; Catalogues of Books, *&c.*

Collections relating to the Lives of the *Engravers* of divers Countries.

Titles of Books printed in moſt Parts of *Europe*, before the Year 1500.

Collection of *Patents* for printing *Law-Books*, *&c.*

Some *German* Cards.

With many other Volumes of Collections of the kinds above-mentioned, tho' not ſo well ſorted.

And theſe *Title-pages* of *Books* are really uſeful, upon many Accounts, *viz.* as being authentick and exact, when as in moſt *Catalogues* the Titles are abbreviated and otherwiſe imperfect. Beſides, theſe Titles informed me of many Books I had never heard of before; and from them I have been enabled to enquire for ſeveral Books, ſome of which I have ſince procured to my great Satisfaction. And it is my Opinion, that there are but few curious Men, but upon the View of this Collection, will own they have here met with ſeveral *Titles*, or other *Fragments of Books*, in their ſeveral ways, which they knew not of before. And thus we ſee, that a ſingle Leaf of Paper, tho' not valuable in its ſelf, yet when come to be part of a Collection, may be of good Uſe, not only in reſpect of the *Matter* it treats of, but as to the *Mark of the Paper*, *the Date*, *Printer's Name*, *Country*, *Title*, *Faculty*, &c.

Mr. *Bagford* has alſo a very plentiful Collection of the Titles of Books remarkable and curious, which he has taken from the Books themſelves. And when they are of ſuch Sorts, as now are ſeldom to be ſeen entire, he has made ſuch Obſervations, as that the ſeveral Editions ſhall be certainly known, tho' your Book be imperfect at beginning and end.

CHAP.

CHAP. II.

Chronology. Hiſtory. Antiquities.

I. 1.] THE Learned *R. Thornton*, Eſq; on reading Dr. *Wallis*'s Letter † concerning the Obſervation of *Eaſter*, made this Calculation.

The Rule *for finding* Eaſter; *by Mr.* R. Thornton; *communicated by Mr.* R. Thoresby. *n.* 297 *p.* 1901. † *Vid. ſupra*, V. iii. *p.* 402.

Rightly to underſtand the Rule in our *Common-Prayer* Books for finding *Eaſter*: Note,

1. That the 21ſt of *March*, in all but Leap-years; and in Leap-years the 20th of *March*, was, at the Time of the Council of *Nice*, when this Rule was made, the vernal Equinox: Conſequently,

2. That the 20th of *March*, in Leap-years, is the ſame as the 21ſt of *March* in common Years.

3. That the Full Moon meant in this Rule is not to be found in our Almanacks, but by the Kalender of our Common Prayer Books, where, in the firſt Column, the Golden Number of every Year is placed over-againſt the Day of the New-Moon in every Month of the Year.

4. That the 14th Day, including the firſt Day of the Moon, is the Full-Moon, and not the 15th, as Dr. *Wallis* would have it.

2.] Having met with ſeveral Explanations of the Rule for *Eaſter* in our *Common-Prayer* Book, but none right and ſufficient; I have undoubtedly collected the true Senſe of the ſame, by comparing the ſaid Rule and the Table for *Eaſter* in the *Common-Prayer* Book together.

Explanation of the Rule for finding Eaſter; *by Mr.* J. Jackman, *n.* 303. *p.* 2123.

The Rule is thus worded, *viz.*

> Eaſter-Day *is always the firſt* Sunday *after the firſt full Moon, which happens next after the One and twentieth Day of* March. *And if the full Moon happens upon a* Sunday, Eaſter-Day *is the* Sunday *after.*

For the right underſtanding of which, it is ſufficient to obſerve;

1. That the full Moon meant is the 14th Day of the Moon, according to the Kalendar in the *Common-Prayer* Book (which may be call'd the Church-Kalendar) counting that Day of the Month for the firſt of the Moon, which hath the Golden Number of the Year collateral to it in the firſt Column of the ſaid Kalendar. And,
2. That theſe Words [*next after* Mar. 21.] are meant incluſively, as if it had been ſaid [next after the Commencement of *Mar.* 21.] ſo that if the full Moon happens on *Mar.* 21. the ſame muſt be the Paſcal full Moon.

Now, in order to prove theſe Obſervations are both right, and ſufficient for the underſtanding of the Rule, I ſhall only ſuppoſe, that if they are neceſſary and ſufficient to reconcile the Rule with the authentic Table to find *Eaſter*, (from which Practice never varies) then are they right and ſufficient. Which being premiſed,

1. I prove that the firſt Obſervation is neceſſary to that End: Becauſe, if the *Paſchal* full Moon be any Day before or after the 14th of the Moon by the Church-kalendar, then the Rule and the Table will claſh. For, 1. If it be any Day before, then as often as the ſaid 14th of the *Paſchal* Moon is a *Sunday*, that very Day, at lateſt, muſt be *Eaſter-day* by the Rule, as being a *Sunday* after the full Moon therein meant: Whereas by the Table and Practice it is not till the *Sunday* after that. Thus *Sunday*, *April* 1. this Year (1705.) was the 14th Day of the Moon by the Church-kalendar, and therefore muſt have been *Eaſter-day* (or after) by the Rule, if the full Moon therein meant had been any Day before the ſaid 14th of the Moon; whereas *Eaſter-day* was *April* 8. by the Table, and accordingly obſerv'd. And this obliges us not to underſtand the true full Moon by the full Moon in the Rule, becauſe that happens about four Days before the 14th of the Moon by the Church-kalendar. 2. If the full Moon meant in the Rule be any Day after the 14th of the *Paſchal* Moon by the Church-kalendar, then as often as the ſaid 14th happens to be *Saturday*, and conſequently the full Moon meant in the Rule to be the *Sunday* following at ſooneſt (that being the very next Day) that *Sunday* cannot be *Eaſter-day* by the Rule; whereas by the Table and Practice it is. Thus *Saturday*, *April* 4. 1702, was the 14th Day of the Moon by the Church-kalendar; and therefore if the full Moon meant in the Rule were any Day after that, it muſt have been on *Sunday*, *April* 5. at ſooneſt; conſequently, *April* 12. at ſooneſt, muſt have been *Eaſter-day* by the Rule; whereas *April* 5. was *Eaſter-day* by the Table and Practice: And this evinces the Miſtake of thoſe, who make the 15th Day of the Moon to be the Full in the Senſe of the Rule; as Dr. *Wallis*, and Mr. *Wright*, in his *Poſtſcript* to his *Short View of Mr.* Whiſton's *Chronology*, &c. and the *Introductio ad Chronologiam*, (reprinted at *Oxford*, A. D. 1704.) *p.* 37.

2. I prove the ſecond Obſervation neceſſary to the ſame End; becauſe a full Moon in the Senſe of the Rule, (*viz.* the 14th Day of a Moon by the Church-kalendar) often happens on *March* 21. and in that Caſe the *Sunday* following is always *Eaſter-day* by the Table and Practice; whereas it muſt be a Month after by the Rule, unleſs we underſtand theſe Words, [next after *March* 21.] as I explain them. And this will be the Caſe next Year (1706.) nor doth the Proof of this Point need the Suppoſition of the foregoing, (though that may now be fairly ſuppos'd, as being already prov'd:) For, count you the full Moon how you will, *March* 22. can never be *Eaſter-day* by the Rule, unleſs *March* 21. may be the *Paſchal* full Moon by the ſame;

and yet *March* 22. is *Eaſter-Day* by the Table and Practice, as often as the Golden Number is 16; and the Dominical Letter D.

I am aware that this ſecond Obſervation may ſeem to many forc'd and unnatural; and that, perhaps, might induce ſome to count the 15th Day of the Moon for the Full in the Rule; and Mr. *Thornton*, to ſubſtitute *March* 20. in Leap-years for *March* 21. neither of which *Hypotheſes*, however, do any ſervice, all things conſider'd. The former, indeed, would vacate my ſecond Obſervation, (*March* 21. never being the 15th Day of the Moon by the Church-kalendar) but then it would make the Rule notoriouſly irreconcileable with the Table and Practice, as hath been already ſeen. And, as to Mr. *Thornton*'s *Hypotheſis*, 1. The only Colour for it (*viz.* That at the Time of the Council of *Nice* the *Vernal Equinox* was *March* 20. in Leap-years, and not *March* 21. as in common Years) is, for any thing that I know, more likely to be falſe than true, and doth by no means follow from the Intercalation. 2. If this Colour were true, it were too great a Nicety to have been probably regarded by the Church. 3. This *Hypotheſis* puts more Force upon the Words of the Rule than mine. And, laſtly, If it were admitted, it would ſolve the Difficulty only in Leap-years, and my ſecond Obſervation would ſtill remain neceſſary; becauſe the Caſe happens as well in Common as in Leap-years; whereof we have an Example in the next Year (1706.) Nor will my ſecond Obſervation be much boggled at by thoſe that know and conſider the incluſive Way of reckoning uſed by the *Romans*, and from them deriv'd to all the *Latin* Churches, and particularly that of *England*; for 'tis as proper to ſay [next after *March* 21.] with the Meaning I contend for, as to ſay, *Tertio (ante) Calendas, Nonas vel Idus* in the Senſe of the *Roman* Kalendar; or, as to ſay (as our Church doth a little after this Rule for *Eaſter*) that *Aſcenſion-day* is Forty Days after *Eaſter*, intending *Eaſter-day* itſelf to be one of thoſe Forty. And 'tis obſervable in this very Rule, that, after it had been ſaid, that *Eaſter-day* is always the firſt *Sunday* after the full Moon, *&c.* 'tis added, that if the full Moon happens on a *Sunday*, *Eaſter-day* is the *Sunday* after; which had been a groſs Tautology, if by the firſt *Sunday* after the full Moon might not be underſtood the Day of the full Moon itſelf, when happening to be *Sunday*. And if the *Sunday* of the full Moon may be ſignified by the firſt *Sunday* after the full Moon, then the full Moon of *March* 21. may be ſignify'd by the full Moon next after *March* 21. 3. I prove, that my two Obſervations are ſufficient to reconcile the Rule and the Table; becauſe I myſelf have drawn up a Table to find *Eaſter* for ever by the Rule underſtood according to thoſe Obſervations, and in the plain and obvious Senſe in all other reſpects; and upon comparing, have found it to agree in every Particular with the Table for the ſame Purpoſe in the Common-Prayer Book.

An Account of Norman Coins *found at* York; *by Mr.* R. Thoresby. *n.* 267. *p.* 2127.

II. Mr. *Samuel Buxton*, late Sheriff of *York*, deſigning to build upon a Piece of Ground he had bought in *High Ouſegate*, had Labourers to remove the Rubbiſh of a former Houſe; which, with about 30 more, was burnt down *April* 3. 1694. In digging below the Foundations of the former Houſe, at a conſiderable Depth they diſcover'd the more ancient Foundations of an older Fabrick, very probably unknown to the Builders of the later Houſe. Theſe lower Foundations were very well ſupported at ſeveral Angles with good Oak Piles, ſome of which were ſo firm and ſound, that they were good again for the ſame Purpoſe; beſides theſe Piles, there were ſeveral great Timber-trees, that lay athwart, to make the ſtronger Foundation: Betwixt the Head of two Piles in this lower Foundation, the Workmen found a little decayed *Oak-box*, wherein had been hoarded about 200, or 250 Pieces of the *Norman Coins*; but Age and the Moiſture of the Place had ſo defaced them, that not much above 100 of them could be preſerved. I had the Peruſal of about half that Number; which proved the nobleſt Stock that ever I ſaw, or indeed heard of, of *William the Conqueror's* Coins; not above two or three in the whole Cargo that I ſaw being of any other Prince: Thoſe, though later in Time, are more rare in Value than many of the *Roman* and *Saxon Coins*: Theſe lower Foundations alſo very well anſwer the Account we have of the *Timber-buildings* in thoſe Ages.

William *the Conqueror.*

The Coins are very much alike; the King is repreſented full-faced, with a Crown and Labels, but neither Sceptre, Croſs, or Star, as in other Moneys of his that I had before; moſt of them are inſcribed *WILLEMV REX*, which ſome have miſtaken for *William the Second*; but by the declining of the Strokes, it appears to be deſign'd for *V*, as I have one with the *S* after the *V* and before *REX.* By this Accident there appears greater Variety, than ever was known before, of the *Conqueror's* Money. I have of theſe Sorts, *WILLEMV REX. WILLEMVS. REX. WILLEMV REX. I.* (which is not to be reckon'd a Numeral Letter, it being improper to pretend a Diſtinction, when there was none of the Name before, but for part of the Letter *A*) *WILLEM REX A.* (*Angliæ.*) And for the Reverſe I have that were coin'd at *LUNDRE* (*London.*) *EOFER wick.* (*York.*) *WINC* (*Wincheſter.*) *EXETE* (*Exeter.*) *LIN* (*Lincoln*, I preſume, *Lyn-Regis* not being old enough.) *LINCOL* (*Lincoln.*) *DEOTFORND* (*Thetford.*) and *LOYNC* (which I take for *Loyn* or *Lancaſter.*) I have only one Duplicate, which I preſent to you, and hope you will find it ſafe in the Seal of the Letter; 'tis inſcribed + *WILLEMV REXI.* Reverſe + *DEII. IRDON LIN.*

An Account of ſome Swediſh *Coins, by the* ſame. *n.* 297. *p.* 1901.

III. I have a *Swediſh Coin*, or rather ſquare Copper-Plate, nine Inches broad, and nine and a half long, which is much like *the Roman Æs grave*, and was current there ſo lately as *Ann.* 1679, (though now they are not to be met with.) It has at each Corner the Impreſſion of a Crown, under which is the Year, and round it this Inſcription, CAROLUS XI. DG. SVE. GOT. WAN. REX. and in the middle of the Plate is a Circle 2 DALER. SöIH. M^{rk}. The other Side of the Plate is without any Inſcription.

I have *een Svenſka marc* of *Charles* the 9th with it, ſurrounded with Rays of Glory in the midſt of the *Area* on the Reverſe, and a Mark, ½ Mark, and a 2 Mark Piece all of the famous *Guſtavus Adolphus*, with the like Characters above the King's Head.

Pewter Money *coin'd by the late King* James *in* Ireland; *by Mr.* T. Putland. *n.* 297. *p.* 1875.

IV. King *James* having turned all the Braſs Guns of *Ireland*, and all the Braſs and Copper Veſſels of Proteſtants that he could ſeize, into Coin, *viz.* Half-Crowns ſomewhat bigger than an *Engliſh* Halfpenny, Shillings broader, but not ſo thick as a Farthing, and Sixpences in proportion; it was order'd to paſs current in all Payments, even in Bonds and Diſcharge of Judgments and Statutes; (inſomuch that if Ages to come knew not the Reaſon, they would admire to be told, that there was a time when Men abſconded, to avoid receiving their Debts, as many here did:) But theſe Stocks of Metal being all ſpent (which he began to coin in *June* 1689.) and no Circulation to bring them back into his Treaſure, he call'd in all that he had coined, and the Half-Crowns, which before were ſtamped with a Face, were re-ſtamped with his *Effigies* on Horſeback, and then paid out to thoſe who brought them in, as Crowns, and the ſmaller Coins were melted down, and recoined again under the ſame Denominations, but with leſs Metal. After the Turn was ſerved by this Stratagem, he had not wherewithal to import Copper and Braſs; but, for want of it, made uſe of the Pewter Diſhes, *&c.* — And the Proclamation to make this Coin paſſable was as ready as the Stamps, for it was prepared: But King *William* paſſing the *Boyne*, prevented their proclaiming it. There was very little of it coined, for our Government could meet with none of it; until one Day, rummaging their Treaſure, that they had left behind them in *Dublin* when they were routed, by Accident I met with one Bag of 150 of thoſe Pieces.

This Crown Piece of Pewter has the ſame Inſcription on both Sides, as the common Braſs Crowns; but there is this Legend added upon the Rim of it, *MELIORIS TESSERA FATI ANNO REGNI SEXTO.*

Roman Antiquities *near the* Devizes *in* Wiltſhire; *by Mr.* J. Clarke. *n.* 268. *p.* 758.

V. On *December* the 4th, 1699, a certain Perſon digging in a Ground of Sir *John Eyles*'s, near the *Devizes* in *Wiltſhire*, about two Foot under the Surface, took up a Pot of a pretty narrow Mouth, about 18 Inches in its greateſt Circumference, and 10 Inches deep, the Clay of a blueiſh Colour, and of ſuch Strength and Compactneſs as it ſeem'd but little injur'd by Time, containing ſeveral Hundred Pieces of ancient *Roman* Coin by different Emperors, with great Variety of curious Figures, and Devices on the Reverſes. The moſt

were

Salonina.
-lena.
Pots.

were of Copper, and but a very few of mix'd Metal. A great Number had the Characters effaced, but the legible were the faireſt I ever ſaw. 'Tis obſervable, many of the ſaid Pieces were gilt with Silver, which on ſeveral that I have ſeen ſeem'd very little impaired, tho' they have lain under-ground for ſome Ages, and appear'd as much canker'd as the reſt. I have among ſeveral others two very odd Pieces; one of them gilt; on one Side a Woman's Face, with this Inſcription, SALONINA AVG. the other a Woman's Face, Part of the Inſcription HE-LENA; the remaining Characters I cannot decypher. On the Reverſe, PAX PVBLICA. This latter is of a mix'd Metal reſembling Braſs, of the Largeneſs of a Silver Penny, ungilt. Thus far of Coin. About the ſame time, and within a few Yards of the ſame Place, were found ſome Pots, made of very firm and durable Clay, of pretty ſtrange Figures, and different Earth, two of which I have by me: One of them, ſomewhat reſembling an Oyſter-Pot, is about $\frac{3}{16}$ of an Inch thick, 9 Inches in Circumference, and 5 $\frac{1}{2}$ in Depth, and for Strength and Compactneſs, ſcarce to be parallel'd by any now made; the other is one half of the Pot, in which the Treaſure was found. There is likewiſe another Pot in the hands of another Perſon, of about 11 Inches Circumference, and 3 $\frac{1}{2}$ deep, wherein was found a whitiſh Powder, ſuppoſed by the Owner to be the Aſhes of human Bodies, and therefore by him taken to be an Urn. But the Experiment made on the ſuppoſed Bone-Aſhes, by putting a ſmall Portion into the Bowl of a clean Tobacco-pipe made glowing, it ſoon appeared to the contrary; for the ſaid Matter immediately kindled into a bright Flame, and ſent forth a Scent ſomewhat like that of Hoofs or Horns, tho' it had a very fragrant Smell before. I am told moreover, that 'tis very uſual in theſe Parts of the Kingdom to find various ſorts of ancient Earthen-Ware, ſome exceeding *China* in Fineneſs. I remember I once ſaw a Piece in the Hands of an Apothecary in *Caln*, that had been finely gilt with Gold.

An Account of Roman Coins *in* Yorkſhire, *by Mr.* R. Thoresby. *n.* 316. *p.* 134.

VI. Mr. *Arthington* ſhewed me ſome *Roman* Coins, which were lately plough'd up at *Cookeridge*; which are a Confirmation of the Conjecture that the *Roman Via Vicinalis* (which comes from the great Military Road upon *Bramham Moor*) paſs'd from that Station at *Adellocum* (of which there is an Account, *Phil. Tranſ.* N° 282.*) through theſe Grounds to *Ilkley*.

* *Vid.* Infra, S. IX.

Domitian.

There are but few of them, not above twenty, but thoſe moſtly very fair: The eldeſt is of *Domitian*, *Ann. Urb. cond.* 846. which falls in with *A. D.* 95; his Head is ſurrounded with this Inſcription, IMPerator CAESar DOMITianus AVGuſtus GERManicus P. M. (Pontifex Maximus) TR. P. (Tribunitia Poteſtate) XIIII. The Reverſe ſhews he was then ſaluted Emperor the twenty-ſecond time, IMP. XXII. COS. (Conſul.) XVI CENS. PP. (Pater Patriæ.) The *Flavian* Family particularly affected the Title of *Cenſors*; and *Domitian* is the laſt Emperor who has that Title upon his Medals: the Figure upon this Reverſe has a Helmet upon the Head, and a Spear in the Right Hand. The next is *Nerva*'s:

IMP. NERVA. CAES. AVG. PM. TRP. COS. Reverſe, CONCORDIA EXERCITVVM. Dextræ junctæ. *Nerva.*

The next Seven are of *Trajan*'s, but all different.

IMP. CAES. NERVA. TRAIANVS. GERM. Reverſe, PM. TRP. COS. III. PP. figura ſtolata ſtans, ſiniſtra cornucopiæ. *Trajan.*

The next has the ſame Inſcription, ſave that it was in his 4th Conſulſhip, and has *figura galeata cum haſta.*

IMP. TRAIANO. AVG. GER. DAC. PM. TRP. Reverſe, COS. V. PP. SPQR. (Senatus Populuſque Romanus) OPTIMO PRINCipi. Pacis ſtantis typus, dextra facem admoventis ſpoliis, ea conflagraturus, ſiniſtra cornucopiæ tenentis. (Exergue) PAX.

IMP. CAES. NER. TRAIANO. OPTIMO. AVG. GER. DACico. Reverſe, PM. TRP. COS. VI. PP. SPQR. Deus Genius ſtans, dextra pateram.

IMP. TRAIANVS. AVG. GER. DAC. PM. TRP. Reverſe, COS. VI. SPQR. OPTIMO. PRINC. fig. ſtolata.

IMP. TRAIANO. OPTIMO. AVG. GER. DAC. PM. TR. P. P. Reverſe, COS. VI. PP. SPQR. figura ſtolata dextra Caduceum, ſiniſtra cornucopiæ.

IMP. TRAIANO. AVG. GER. DAC. P. M. TR. P. COS. VI. PP. Reverſe, SPQR. OPTIMO. PRINCIPI. Columna cochlidis *Trajani.*

The reſt that are legible are of *Hadrian*'s, *viz.* *Hadrian.*

HADRIANUS. AVGVSTVS. Reverſe, COS. III. Victoria cum Palma.

The other has upon the Reverſe:

FELICITATI. AVGVSTI. Above the *Navis Prætoria*, and below it COS. III. PP.

Theſe are all of Silver: There was a large one of Copper of the Emperor *Domitian.* *Domitian.*

IMP. CAES. DOMIT. AVG. GERM. . . . .
but the Reverſe was not legible.

John Dyneley of *Bramhope*, Eſq; has alſo three, one with FIDES EXERCITVVM, one of *Titus*'s, and one of *Trajan*'s with *Dacia* Captive under a Trophy; but I want the Inſcriptions: All the reſt are in the Poſſeſſion of the ingenious *Cyril Arthington* of *Arthington*, Eſq; who oblig'd me with one, the Figure whereof I ſend you, it being upon a remarkable Occaſion, and not mention'd in *Occo* (at leaſt in my Edition of that Author;) 'tis inſcribed HADRIANUS AVG. *Hadrian.*

Fig. 1, 2.

COS. III. PP. Reverſe, RESTITUTORI HISPANIÆ. This was upon his peaceable ſettling of Affairs in that his native Country; *Spain* is repreſented here as a Woman with a Branch in her Right Hand, to denote her Fruitfulneſs, kneeling before the Emperor, who kindly takes her by the Hand to raiſe her up.

By theſe it appears, that this Station flouriſh'd when the *Roman* Empire was in its prime; and there being none of a later Date, makes it probable, that it periſh'd in ſome of the Inſurrections of the native *Brigantes*, about *Severus*'s Time, as it was conjectur'd from the Form of the Letter A in the Inſcriptions upon the funeral Monuments accounted for. † (*Philoſoph. Tranſact.* N° 282.)

† *Vid.* infra, *S.* ix.

Roman *Coins near* Edlington *in* Yorkſhire, *by Mr.* Thoresby. *n.*303. *p.*2149.

VII. Theſe *Coins* were dug up at the Eaſt Entrance of *Clifton* (a Village on the Cliff of the Hill) three Miles from *Doncaſter*, the *Roman Danum*, where the *Præfectus Equitum Criſpianorum* reſided, and one from *Cunſbrough*, or *Coningſburgh*, an ancient Seat of the Kings during the *Saxon* Heptarchy, now belonging to Mr. *Cook* of *Norfolk*. They were found ſo near a Highway, that the Cart-tracks had worn the Earth off the top of the *Urn*, which a Labourer ſtruck his Pick-Ax into, before he was aware of it. Upon another Search they found another *Theca Nummaria*, both full of Copper Coin; the Haſte and Scramble of the Workmen to get the ſuppoſed Booty, made them break in pieces both the Urns, which were large and entire; the bigger of them might contain two Gallons: By the Fragments of them they appear to have been of a finer Clay than thoſe found at *South-Holland* in *Lincolnſhire* *, and the Coins alſo much better preſerv'd, being in a drier Soil. Of Sixty I bought of thoſe found at *Fleet*, Com. *Linc.* there was not one before *Gallienus*, nor after *Quintillus*; and of near 150 of theſe from *Clifton*, there is not one of an elder or later Date; ſo that both thoſe in *Holland*, and theſe in *Yorkſhire*, ſeem to have been hid in ſome common Calamity that follow'd the Death of that ſhort-liv'd Emperor *Quintillus*, who reign'd but ſeventeen Days, *Anno Dom.* 271. And within ſix Years after, we find that *Probus* the Emperor, upon ſome Commotions in *Britain*, ſent over certain *Vandals* and *Burgundians*, who had invaded *Gaul*, to inhabit *Britain*; upon whoſe Arrival, probably, ſuch as had made the Inſurrection, might conceal their Treaſure; and being ſlain in the Conflict, it lay hid till now. This I look upon as a more probable Conjecture, than the Perſecution of *Diocleſian*, which was not till thirty-four Years after. So far as are in Capital Letters are upon the Coins, and the reſt are only for Explanation.

* *Vid.* ſupra, *Vol.* IV. *P.* ii. *Chap.* iii.

Reverſes of Gallienus.

SECVRITas PERPETua. PAX AVGuſti. APOLLINI CONſervatori AVGuſti. PVDICitia. LAETITIA. AEQVITAS. AVG. AETERNITAS AVG.

LIBEro Patri CONS. AVG. DIANAE CONS. AVG. MARTI PACIFERO. . . . . . P. VII. COS. (Pietas libans) . . . . S. STATOR; which I take for *Mars*, who is ſometimes ſo ſtiled as well as *Jupiter*. VICTORIA AETERna. CONCORdia. . . *Salo-*

Salonina. Reverſa VESTA. *Salonina.*

Poſthumus. PAX AVG. P. M. TRP. COS. V. which I take to be remarkable, having not met with any more than the 4th Conſulſhip. *Poſthumus.*

Victorinus. INVICTVS (*Typus Solis vel Apollinis*) VIRTVS AVG. PAX AVG. SALVS AVG. PIETAS AVG. *Victorinus.*

Tetricus the Father. SALVS AVG. PAX AVG. HILARITAS AVG. VICTORIA AVG. FIDES MILITVM. LAETITIA AVG. SPES PVBLICA. COMES. VIRTVS AVG. COMES AVG. *Tetricus* the Father.

Tetricus Cæſar. SPES PVBLICA. SPES AVGG. PIETAS AVGuſtorum. *Tetricus Cæſar.*

Claudius. GENIVS EXERCI. LIBERALITAS AVG. VIRTVS AUG. VICTORIA AVG. PAX AVG. FELICITas TEMPoris. AEQVITAS AVG. IOVI VICTORI. *Claudius.*

Quintillus. PROVIDENTIA AVG. VIRTVS AVG. *Quintillus.*

VIII. The *Roman* Monument, lately diſcover'd at *York*, was found in digging a Cellar in *Coning-ſtreet*, not far from the *Roman* Wall and Multangular Tower, † that Dr. *Liſter* has given ſo curious and particular a Deſcription of. This Monument, dedicated to the *Genius* or tutelar Deity of the Place, is not of that coarſe Rag that the Generality of the *Roman* Monuments are, but of the finer Grit, like the Altar at the Lord *Fairfax*'s Houſe in *York*: 'Tis 21 Inches long, and 11 broad, and is inſcrib'd GENIO LOCI FELICITER. There was a larger Stone found with it, but without any Inſcription; nor is there upon either of them the Repreſentation of a Serpent, or a young Viſage, by both which the Ancients ſometimes deſcrib'd theſe *Dij Topici*; if the Name had been added, it would have gratified the Curioſity of the *Neoteric* Antiquaries; but they muſt yet acquieſce (for aught I know) in the old DVI, who is ſaid to be the *Tutelar Deity* of the City of the *Brigantes*; from which *Diw*, as the *Britons* call'd him, *Dewſbury*, or *Duiſburg* in this Neighbourhood, ſeems to have receiv'd its Name; a Place now chiefly noted for a ſort of coarſe Cloth there made, and thence call'd *Duberians*. The Monument is of this Form.

An Account of a Roman Inſcription, *by Mr.* R. Thoresby. *n.* 303. *p.* 2145.

† *Vid.* ſupra, *Vol.* III. *P.* ii. C. ii. *S.* 13.

Fig. 3.

The Author of this *Votive* Monument ſeems to have had the ſame ſuperſtitious Veneration for the *Genius* of *York*, as thoſe at *Rome* had for theirs, whoſe Name they were prohibited to utter, or enquire after; hence it is, upon their Coins the Name of this Deity is never expreſs'd, but in a more general manner by *Genius P. R.* or *Pop. Rom.* Such a one I have of *Conſtantius*, minted at *London*, as appears by the Exerg. LON. under the Effigies of that Deity, with a *Patera* in the Right Hand, and *Cornucopia* in the Left, inſcrib'd GENIO POPULI ROMANI. I rather inſtance in that of this Emperor (the Father of *Conſtantine* the *Great*) becauſe he made *York* his Imperial Seat, and was here deiſy'd; the Medal of whoſe *Apotheoſis* I alſo have, minted at the ſame Place, and inſcribed MEMORIA FELIX, which I mention (though nothing relating to the Genius) becauſe of the Expreſſion of a noted Antiquary (*Burton*'s *Com.* upon *Anton. Itin.* p. 78.) “ That *Rome*, “ in the Height of its Greatneſs, had not a more glorious and gallant “ Show to exhibit, than what this poor Piece of Copper would expreſs.” As the *Genius* of the *City of Rome* was expreſs'd by G. P. R. ſo that of the *Commonwealth*, in a moſt ſordid Flattery, by that of the *Emperor*, who they pretended to be their *happy Genius*. I have one even of *Nero*, and not only after his *Quinquennium*, but the Year after he had laid moſt of the City in Aſhes; yet, by the expreſs Order of the Senate, inſcrib'd GENIO AVGVSTI. S. C. Some of the Fathers have therefore juſtly reproached the *Romans* for paying a greater Veneration to the *Genii* of their Emperors, than to *Jupiter* their ſupreme God. This Cuſtom of deifying the *Genii*, and that of aſſigning *Gods* for Defence of particular Cities, is very ancient, as appears by what the Prophet *Jeremiah* (ii. 28. and xi. 13.) ſaith of revolting *Judah*, *According to the Number of thy Cities are thy Gods*; after the manner of the Heathen, who, according to *Varro* (*Pool*'s *Synopſis Critic. in loc.*) had above thirty thouſand; and yet, notwithſtanding this prodigious Number, it is evident from their Medals, that ſeveral Cities were ſometimes aſſign'd to the ſame tutelar Deity. Thus the *Greeks* (from whom the *Romans* receiv'd this and ſeveral other of their Superſtitions) committed both *Magneſia* and *Smyrna* to the Protection of *Cybele*. Medals of the former are more common, of the latter more rare. His Excellency Baron *Spanheim* has writ a learned Diſcourſe upon them, which makes me more to value one in my *Muſæum*, which has the Effigies of that *Mother of the Gods* with her towered Head, and CMΥPNA; upon the Reverſe is a Lion Paſſant, with CMΥPNAIΩN. I have alſo a large curious Medal of *Julius Philippus*, that would tempt us to believe that *Antioch* alſo was devoted to the ſame *Cybele*; for it has round her Head with the turreted Crown ANTIOKEΩN MHTPOKOΛΩN. with Δ (or rather Λ) E and SC on each ſide the Head. I muſt own myſelf ſomewhat at a loſs about the latter Word, except the *Greek* and *Roman* Tongues began then to admit of a ſort of mongril Mixture; ſo that from MHTER and *Colonus* might proceed MHTPOKOΛΩNΩN; and ſo the *Antiochians* have the Title of the Men of the Mother-Colony, the ΛE which are *Greek*, the SC in *Latin* Characters, the former ſignifying *Luſtrum Quintum*, the other *Senatus Conſulto*, ſeem to countenance this Conjecture, the *Roman* S being different from that in ΦIΛIΠΠOC and CEBαϛὸς upon the ſame Coin.

This Curioſity of the City of *Antioch* is not ſo valuable as it was the Metropolis of all *Syria*, and highly applauded by *Ammianus Marcellinus* (who liv'd within a hundred Years of this Time) as it is becauſe here the Name of *Chriſtians* was firſt taken up, and that St. *Paul* both preached and kept a Synod here, as *Euſebius* tells us; and ſo another

I have of *Antoninus Pius*, inſcribed ΒΕΡΟΙΑΙΩΝ, which is more valuable in my Fancy for that Paſſage, *Acts* xvii. 2. than if it could be certainly aſcribed to the nobleſt of the four Cities that bore the ſame Name.

The Veſtigia of a Roman Town *at* Adell *in* Yorkſhire, *by Mr.* R. Thoreſby. *n.*282. *p.*1285.

IX. 1.] There has been lately diſcovered the *Veſtigia* of a *Roman* Town, upon the *Moor* near *Adell* Mill, four Miles from *Leeds*; 'twas found out accidentally by a Tenant of Mr. *Arthington*, who endeavouring to plow Part of his Farm, was retarded by a great Quantity of Stone, immediately below the Surface of the Earth, which he was forced to dig up before he could proceed, and has already, out of the Foundations of Houſes, which they traced on both ſides the Street, got ſo many Stones as has built above 100 Rods of Walling. At a very little Diſtance is a *Roman Camp* pretty entire; 'tis above four Chains broad and five long, ſurrounded with a ſingle Vallum, which from the top of the Agger to the bottom of the Trench is yet twenty-two Foot deep in the Place I meaſured. The Town ſeems to have been of conſiderable Note by the *Inſcriptions*, and Fragments of *Statues*, *Pillars*, &c. there dug up, all which (as Dr. *Liſter* has truly obſerved, that moſt of the *Roman Monuments* in theſe Parts) are made of the common ſort of coarſe Rag or Millſtone Grit, of which are alſo the Remains of a large *Aquæduct*, in Stones of a great Length, and about ¼ of a Yard thick, wherein the Paſſage for the Water is about ſix Inches broad and as many deep, almoſt double to thoſe of Clay found in the *Roman* Burying-place at *York*, formerly accounted for, † one of which is in the Repoſitory of the *Royal Society*. Some time ago here was dug up a *Statue* to the full Proportion of a *Roman* Officer, with an Inſcription; both which periſhed through the brutiſh Ignorance and Covetouſneſs of the Labourers, who in a ſuperſtitious Conceit bound Wythys or Wreaths of Straw about the poor *Roman* Knight, and burnt him, in hopes of (by I know not what magical Apparition in the Smoke) finding ſome hid Treaſure, and after in Anger at their Diſappointment broke him to pieces, of which only the Head is now forth-coming; but the two Inſcriptions lately diſcovered there are preſerv'd. *Cyril Arthington* of *Arthington*, Eſq; made me a Preſent of theſe Inſcriptions; the one is but a Fragment, yet has enough to diſcover it to have been ſepulchral, by the H S E for *Hic ſitus eſt*, below *PIENTISS*; the other is almoſt entire, and is evidently a *Funeral Monument*; it begins as uſually, with *Dijs Manibus Sacrum*, and ends *Vixit Annos* X, as it ſeems to have been by the Vacancy: 'tis one Foot thick, two broad, and three high; the Letters are very large, full three Inches long, ſome of them interwoven, as AND (AD) and ED (as I apprehend the ƐD to be) in *Candiedianæ*. The Form of the Letters, and particularly the A, may perhaps diſcover the Age that this *Roman* Station flouriſhed in, *viz.* in *Severus*'s Reign (*Anno Dom.* 194.) or before, if the Obſervation of Mr. *Cam-*

† *Vid.* ſupra, Vol. III. P. ii. C. ii. S. xiv.

Two Inſcriptions.

Fig. 4.

Fig. 5.

Mr. *Camden* (in his *Britannia N. E.* p. 808.) hold good, and I know none of the modern Criticks that diſſent from it.

" This Obſervation (ſays he) I have made, that from the Age of " *Severus* to that of *Gordian*, and after, the Letter A in the Inſcripti- " ons found in this Iſland wants the Croſs Stroke, and is engraved " thus Λ."

It ſeems to have periſhed, and perhaps was burnt down (as by the ſlag and aduſt Colour in ſome Places may be conjectured) in ſome of the Inſurrections of the Native *Brigantes*, who were impatient of Reſtraint.

Mill-ſtones. Amongſt the Ruins were found two or three *Mill-ſtones* for the grinding of Corn, which by the Smallneſs of the Size (20 Inches broad) ſhew that the *Romans* of thoſe, as well as the *Egyptians* and *Jews* of former Ages, made uſe of their Slaves or Captives for that Employ, who were placed *poſt molas*, Exod. xi. 5. *non precedunt*, *ſed ſequuntur*, *brachiis & toto corpore trudentes*; what the old MSS. Bibles have in reſpect of *Sampſon* (Judic. xvi. 21.) *clauſum in carcere molere fecerunt*, our *Saxon* Predeceſſors render expreſsly hanꝺcƿyꞃne. (Mr. *Thwait*'s *Hept. Anglo-Sax.*) Beſides this, which is entire, I have a Fragment of another Mill-ſtone, whereon the Rows are yet remaining; but this being heavier, almoſt as thick at the Circumference as the other is at the Centre, (for they are convex on one Side) I ſuppoſe might be the *Runner*. The learned *Gataker*, in his Notes upon *Iſaiah* xlvii. 2. obſerves, the original Word is of the *Dual Form*, and that the Law prohibiting the taking the Mill-ſtone to pledge, does particularly mention *Receb* or the *Rider*, becauſe that lying looſe might the more readily be taken off, and carried away upon that Occaſion; and in his Annotations (which are incomparably the beſt of thoſe falſly aſcribed to the Aſſembly of Divines) upon *Lament.* v. 13. *they took the young Men to grind*, ſays, the *Talmudiſts* have a Story, that the *Chaldeans* made the young Men carry Mill-ſtones with them to *Babylon*, where there was a great Scarcity of them; whence probably their Paraphraſe renders that Text, *Have borne the Mills* or *Mill-ſtones*, which might be true in a literal Acceptation: They have alſo a proverbial Speech of a Man with a Mill-ſtone about his Neck (alluded to St. *Matth.* xix. 6.) uſed of one that lies under an exceeding heavy and almoſt inſupportable Burden.

Urns. As we were traverſing the Ground, I found the Fragments of *Urns* and other *Roman* Veſſels, one of which has been 23 Inches, or two Foot in Circumference; the generallity of them are of the common red Clay; but I have alſo one of the beſt Coral-coloured Varniſh, and others of a bluiſh Grey; as alſo a braſs Ring found in the ſame Place.

The *Roman* Rig, that this Town ſtood upon, comes from the great Military Road upon *Bramham-moor*, of which *Leland* in his MS. Itinerary affirms, " I never ſaw in any Part of *England* ſo manifeſt a To-

“ ken, as here, of the large Creſt of the Way of *Watling-ſtreet* made “ by Hands.”

From thence this *Via Vicinalis* paſſeth by *Thorner* and *Shadwell*, *Street-lane* and *Hawcaſter-Ridge* upon *Blackmoor* (near which is the *Roman Pottery* *) to *Adel*, thence through *Cookridge* over the Moors towards *Ilkley*, a known *Roman* Station. This ſame Ridge is very evident in ſome part of the Grounds of *Thomas Kirk* of *Cookridge*, Eſq; who ſhewed me the Place where a *Roman* Monument in his Poſſeſſion was dug up; it ſeems to have had a large Inſcription, but ſo eraſed, that nothing diſtinct can be made of it; perhaps the ſaid *Cukeryg*, as it is called in the Original Letters Patents of King *Edward* VI. to Archbiſhop *Cranmer*, (in the Poſſeſſion of that Gentleman) was ſo denominated from this *Roman* Ridge, which paſſeth directly through it.

Via Vicinalis.

* *Vid.* ſupra, Vol. III. P. ii. C. ii. S. x.

But what the Name of this Station was, I cannot divine. The learned Dr. *Gale* ſome Years ago gave me notice, from an Anonymous Geographer, of a Station in *theſe Parts* called *Pampocatia*, which he thought ſhould be read *Campocatia*, and had ſent into *Frrnce* for various Lections, concluding, “ Where to place this I know not, but my “ Hopes are, that you will be ſo happy as to find it, and ſo kind as “ to communicate the Diſcovery, *&c.*” Now conſidering, that in the ſaid Author (printed at *Ravenna, An. Dom.* 1688.) this *Pampo* or *Campocatia* is the very next Station to *Lagentium* or *Legeolium*, it ſeems not improbable that this Camp, *&c.* was the very Place; but becauſe things ſo many Ages paſt admit of various Conjectures, I will offer another, which I am induced to from the Similitude of the Names, the *Agel* or *Adelocum* of the Ancients, and the preſent *Adle* or *Adel*, as it is in the *Monaſticon Anglic.* 'Tis true, 'tis ſometimes writ *Segelocim*; but, as Mr. *Burton*, in his Comment upon *Antoninus*'s Itinerary, well obſerves, it is to be reckon'd among thoſe Words to which the Ancients ſometimes put an S or *Sibilus*, and ſometimes omitted. If this be thought too much northward for that Station, which is placed ſouth of *Danum*, it may be reply'd, that, not to inſiſt upon the Tranſpoſition of ſome Places, of which there are Inſtances in the Itinerary, I ſee no Inconvenience in admitting that the *Romans* might then, as we at this Day, have ſeveral Towns of the ſame Denomination. Thus, from an Altar in my Poſſeſſion, inſcribed *CONDATE* (the whole Inſcription may be ſeen in the new Edition of the *Britan.* p. 782.) the ſaid learned Dean of *York* concludes, that *Conſley* near *Pierſbridge*, where this Altar was found, was as well called *Condate*, as *Congleton* in *Cheſhire*. And to me it ſeems highly probable, that the Legions, being detached againſt the Enemy to diſtant Places, might endeavour to leave ſuch Memorials of their Removes. Thus the *Legio viceſima valens victrix*, uſually quartered at *Deva*, *Weſt-cheſter*, were detached into *Weſtmorland*, as appears by an Inſcription; and the *Lingones*, who were ſeated at *Ilkley*, I queſtion not but were alſo at *Lingivel* near *Thorp on the Hill*,

Adelocum;

where

† *Vid.* ſupra, Vol. III. P. ii. C. ii. S. xxiii.

where the *Roman* Coining Moulds (*Phil. Tranſ.* N° 234. †) were found, and that the Intrenchments there were ſo denominated from them, the *Roman Vallum* being pronounced *Wallum*, of which ſee *Caſaubon*, *Somner*, &c. At this *Agelocum* or *Adelocum*, as *Camden* himſelf once read it, is a Church of the moſt antique Form that ever I beheld, and being built of ſmall ſquared Stones like the *Roman* Wall and Multangular Tower in *York*, I verily thought it the Remains of ſome *Roman* Temple, 'till I found in it ſome Chriſtian Hiſtories, particularly the Deſcent of the Holy Ghoſt in the Form of a Dove, done in *Baſſo Relievo*, but after ſo intolerably rude a Manner, as ſufficiently evidences their great Antiquity. The Inhabitants have an old Tradition, that *Adell* Church once ſtood upon *Blackhill*, the Place where theſe *Roman* Monuments were lately diſcovered, occaſioned perhaps by the Removal of the Stones from ſome publick Edifice at the Deſtruction of the old *Roman* Town.

Roman Monuments *at* Adell, *by the* ſame. *n.* 319. *p.* 289.

2. Three *Roman* Monuments have been ſent me lately from *Adell*, but the Inſcriptions are not legible. One of theſe, though it be made exactly in the Form of an *Altar* in all other reſpects, wants the *Diſcus* or *Lanx* upon the Top; inſtead of the *Diſcus* or *Hearth*, it has three Rolls or Wreaths upon the Top, which are ſo entire, that it is plain there never was any thing elſe wrought upon it. As I have never yet ſeen an Altar without the *Diſcus*, I think it is certain this Monument was never deſign'd for one.

On the ſame, *by the* ſame. *n.* 320. *p.* 314.

3.] The Size of theſe Monuments (which were found amongſt the Ruins upon *Adell* or *Echop-Moor*) at firſt ſeem'd ſtrange to me, they being but 18 Inches high, and ſix broad. One of them, as appears by the *Diſcus*, has been evidently one of the *Roman* portable Altars. That there ſhould be Altars ſo ſmall, was no Surprize to me; but that any other ſort of *Commemorative Monuments* ſhould be no bigger, was new to me, till I found others as ſmall, though of richer Materials, being Marble, in the Collections of *Chriſtopher Wren*, Eſq; and Mr. *Kempe*; whereas theſe are of a very coarſe Stone, as Dr. *Liſter* has truly obſerv'd moſt of thoſe found in the North are.

Not Adellocum, *rather* Burgdunum.

When the *Veſtigia* of this *Roman* Station were firſt diſcovered, I fancied it might have been the *Adellocum* of the Ancients, as I have before ſuggeſted; but ſince that, having peruſed *Domeſday-Book* in the *Exchequer*, I found, beſides *Adele* and *Echope* before-mention'd, another Place in the Neighbourhood call'd *Burghedunum* or *Burgdunum*, which I am now of Opinion was the ancient *Roman* Name of this Station. That the *Itinerary* is ſilent herein, is no Argument againſt it: for none, I preſume, do imagine that the Names of all the Towns in the Province are there recited, but only ſuch as lie upon thoſe Roads that are particularly mention'd; but that it has, at leaſt, the Appearance of a *Roman* Name, may be argued, becauſe *Burghi* was the common Name whereby they call'd ſuch Caſtles and Forts as were convenient for War, and well ſtor'd with Proviſions of Corn; as appears by the Authorities quoted by *Cambden* and *Burton* in their Notes upon the *Roman Verteræ*, or *Burgh*, under *Stanemoor*; and the *Burgundians* received their Name from their inhabiting ſuch Caſtles: And it ſeems probable, that the ſmall ſquared Stones, wherewith the Antique Church at *Adel* is built, were brought from the Ruins of ſuch a Caſtle, and gave Riſe thereby to an old Tradition, which continues to this day, that *Adel* Church once ſtood upon *Black-hill*, the Place where theſe *Roman* Monuments were found; the elevated Situation of which Place ſufficiently accounts for the Termination of the Name, the *Gauliſh* or *Britiſh Dunum*, which ſignifies a Hilly or Mountainous Place, being naturaliz'd in the *Roman* Provincial Language. It may be added too, that within a Mile of it, there are two ſcattering Houſes that do to this day retain the Name of *Burden* (for *Burgdun-*)*Head.*

An Account of a Leaden Coffin *found in a* Roman Burying place *at* York; *by the* ſame. n. 296. p 1864.

X. At Mr. *Gyles*'s without *Boutham-bar* at *York*, a *Roman* Burying-Place has been diſcovered; where in digging Clay for Bricks, they have frequently found Urns †, *&c.* But they have found lately a very remarkable Lead Coffin, which by the Circumſtances ſeems to have been for a Perſon of Quality; 'twas 9 Foot deep in the Ground, whereof 6 were Clay, and 3 a black Earth; the Lead Coffin, which was about 7 Foot long, was encloſ'd in a prodigious ſtrong one made of Oak Planks about 2 Inches and a half thick, which, beſides the Rivettings, were tacked together with Brags, or great Iron Nails; the Nails were 4 Inches long, the heads not Die-wiſe, as the large Nails now are, but perfectly flat, and an Inch broad: I have one ſomewhat different, half an Inch broad, and thin, ſomewhat in the form of a Wedge, and the Head not round as the others, but ſomewhat like the modern Draw-Nails; but the reſt of the old ones are ſquare, the four Sides being of an equal Breadth: Many of them are almoſt conſumed with Ruſt, and ſo is the Outſide of the Planks; but the Heart of the Oak is firm, and the Lead freſh and pliable; whereas one found a Year ago (1701) is brittle, and almoſt wholly conſumed, having no Planks to guard it. The Bones are light, and entire, tho' probably interr'd 1500 Years ago; for 'tis above ſo many Centuries ſince their Cuſtom of Burning gave Place to that more natural one of interring the Dead; which, according to Monſieur *Muret*, was re-introduced by the *Antonines*. I have a Thigh-Bone (which is wonderful light) and the lower-Jaw which was furniſh'd with all the Teeth. The double Coffins were ſo heavy that they were forced to drag them out of the Dormitory with a Team of Horſes.

† *Vid.* ſupra, V. iii. P. ii. C. ii. S. xiv, xv.

Two Roman *Inſcriptions at* York, *proving that the* ninth Legion *reſided there, by Mr.* R. Thoresby, n. 305. p. 2194.

XI. I now ſend you an Account of two *Roman* Inſcriptions found at *York*, one very lately, the other ſeveral Years ago, but no where yet taken Notice of, tho' it hath this very remarkable, That it is an undeniable Argument that the *Ninth* Legion was not only in *Britain*, which is rarely taken notice of, but that it reſided at *York*; which was heretofore unknown. It is a Funeral Monument, whereupon, under the Statue (in *Baſſe-relieve*) of the Standard-bearer of the *Ninth* Legion, is this Inſcription:

L. DVCCIVS
* Lubens voluit. *L. VOT. RVFI
-NVS. VIEN
SIGN. LEG. VIIII.
AN. XXIIX.
Hic ſitus eſt. H. S. E.

This Monument was found in *Trinity-Yard* in *Micklegate* at *York*. That this *Ninth* Legion was in *Britain* in *Galba*'s Time, and that it was alſo *Hiſpanienſis*, appears from Sir *Henry Savile*'s Notes at the End of his Edition of *Tacitus*; but that it, as well as the VIth and the XXth, was alſo called *Victrix*, or that it reſided at *York*, has not been obſerved before; and yet both are evident from this Inſcription upon a *Roman* Brick found there.

LEG. IX. VIC.

This is alſo an Argument of the Peace theſe Parts enjoyed at that Time, (poſſibly the latter End of *Severus*'s Reign) making Bricks, caſting up High-ways, *&c.* being the uſual Employment of Soldiers at ſuch Vacancies.

Sir *Henry Savile* was of Opinion, that this *Nona Hiſpanienſis* in *Britannia* was one of thoſe eſtabliſhed by *Tiberius*, *Caius*, or *Claudius*, or, peradventure, in the latter Times of *Auguſtus*; but, however, that it was certainly here in *Nero*'s Reign, and that *Ratus Cerealis* was then Lieutenant thereof, is evident from *Tacitus*, (*lib.* 14. *cap.* 10.) who gives a lamentable Account of the Slaughter of ſeventy thouſand Citizens and Confederates by the enraged *Boadicea*, in which Number was all the *Foot* of this Ninth Legion: *Cerealis* with the Horſe hardly eſcaping. I ſuppoſe it needleſs to add, that this Number is frequently by the *Romans* writ VIIII as well as IX; for one that is but competently verſ'd in their Coins or Inſcriptions, cannot but have obſerved Inſtances of both kinds: But that this is the Ninth Legion, is confirm'd by the other Inſcription upon the Brick, which was but lately found. I ſhall only add, what Mr. *Hearne* of *Oxford* writes: "I am mightily pleaſed with the Inſcriptions you ſent me relating to "the Ninth Legion, there being now no room to doubt about the

“ Place of Reſidence, a thing which was unknown before; and for
“ that Reaſon, thoſe who have written about the *Roman* Legions have
“ ſaid nothing about this, but leave us quite in the Dark: Only *Urſatus*
“ [in his Book *De Notis Rom.*] does remark, that it muſt be
“ ſomewhere in *Britain*, becauſe *Tacitus* tells us, that when the Colony
“ at *Camalodunum* was deſtroy'd by *Boadicea*, *Pætelius Cerealis*, Legate
“ of the ninth Legion, came to their Aſſiſtance; but yet he
“ makes no mention of its being ſtiled *Victrix*.”

Remarks on a Fragment of a Roman Inſcription found in the North of England by —— n. 356. p. 813.

XII. The following Inſcription was found among the Remains of the Ruins of the famous *Picts-Wall*, built by the *Romans* to ſecure themſelves againſt the Incurſions of the Natives of that Part of *Britain* they cared not to conquer. The Inſcription, tho' broken and in great Part illegible, ſuffices to fix the Name of one of the ancient Nations of *Britain*, that has hitherto been greatly miſcalled. 'Tis thus,

CIVITATE CAT
VVILLAVA'
ORVM·L·O[S
CDIO'

and is to be ſeen on the *Wall*, about two Miles Weſt from *Lenercroſs-Abby*, near the Confines of our two Northermoſt Counties.

Catuvillauni;

Here 'tis obſervable, that the laſt A of the ſecond Line has a Mark that follows it, not unlike to the laſt Stroke of an *N*; and if inſtead of A' we put *N*, we ſhall read it CIVITATE CATVVILLAVNORUM, which we cannot doubt to have been the true Name of that People which *Dion Caſſius*, lib. lx. calls Κατϋελλανοὶ, and *Ptolemy*, in his Geography, *lib.* ii. *cap.* iii. more falſly, Κατυευχλανοὶ; the firſt λ by producing the tranſverſe Stroke having been miſtaken for χ. This Nation appears by *Dion* to have been more potent than their Neighbours the *Dobuni*, (whom he calls *Boduni*;) and had, according to *Ptolemy*, *Verolamium* for their Capital, which 'tis moſt probable was the *Caſſivellauni oppidum* of *Cæſar*. So that it ſhould ſeem *Caſſivellaunus*, King of theſe *Catuvillauni* when *Cæſar* invaded *Britain*, either gave his Name to his People, or took theirs. But he was no doubt the moſt potent Prince at that time in *Britain*, ſince by common Conſent of the reſt, he was made General of their united Forces, in Defence of their Country's Cauſe againſt the *Romans*.

A Roman Inſcription at Caerleon, by the Reverend Mr. C. Rice. n. 359. p. 940.

XIII. A Perſon in *March* 1717, being at plough in a Cloſe near the Bank of the River *Uſk*, which the Ancients called *Iſca*, (which glides by *Caerleon* about a quarter of a Mile off, and in Sight of this Town) came thwart a Stone, and finding Letters thereon, took it up whole; 'tis about a Yard in Length, and about three quarters broad. I went to the Place, and took a true Copy thereof. There was underneath it ſome ſeeming oblong ſquare Sepulchre of Stones, rude in Order.

Order, a little farther in that Cloſe, where that River wears out the Land, there was, ſome time before, a large Earthen Pot taken out of the Bank by the River-ſide, which had therein the Skull and Bones of ſome Perſon, by ſome thought to be a Child murder'd; but I rather conjecture it a *Roman* Urn. The Inſcription is as follows.

D M
G. VALERIVS. G. F.
GALERIA. VICTOR
LVGDVNI SIG. LEG. II AVG
STIP. XVII. ANNOR XLV. CV
RA. AGINT. AMNIO. PERPITVO. B

Conjectures *on it by Dr.* J. Harris, *ibid.*

This ancient and fair Inſcription confirms what others have found hereabout; and what *Cambden* and other Hiſtorians ſhew us, *viz.* That the ſecond *Roman* Legion, called *Auguſta*, brought into *Britain* by *Claudius Cæſar* under the Conduct of *Veſpaſian*, was placed here at *Iſca*, or *Caer Legion*, by *Julius Frontinus*, in order to awe the *Silures*: And that General obtained ſeveral Victories over them and their Neighbours in ſeveral Places hereabouts.

There ſeems to be nothing of Moment or of Difficulty in this Inſcription, but *Victor Lugduni*: Which as, I think, we have no Ground from Hiſtory to refer to *Lyons* in *France*, ſo I gueſs that Expreſſion may be thus accounted for. The River *Lugg* is famous in the neighbouring Parts; and as *Dynas* or *Dyn* hath been ſaid to ſignify a Town in the ancient *Britiſh* Language; and that *Dun* doth alſo ſerve to expreſs a Hill, or *Down*, as we ſtill call it, (which I think is derived from the *Britiſh* alſo;) probably *Lugduni* here may expreſs ſome Town or Hill near the River *Lugg*; and ſince there is a Place called to this Day *Luckton*, on the Side of the River *Lugg* in *Herefordſhire*, perhaps that may bid fair to be the very Place where *Valerius* obtained the Victory perpetuated by this Inſcription.

Roman *Inſcriptions and Antiquities in* Yorkſhire, *by Mr.* Chr. Hunter, n. 278, p. 1129.

XIV. As to the *Roman* Station in the County of *Durham*, at a Village called *Ebcheſter*, I could not till very lately ſatisfy myſelf ſo far as to be able to reduce my Mind from the vulgar Opinion, that this has never been more than a Place named from that Pious Virgin St. *Ebba*, which is all Mr. *Cambden* ſays of it.

It has been ſurrounded with a Wall of hewn Stone, and ſeems to have been an exact Square of about 200 Yards on every Side: Here have been Suburbs toward the Weſt, South, and perhaps Eaſt, of a conſiderable Extent: But towards the North, the Wall has ſtood upon the Top of a ſteep Bank, under which runs the River *Derwent*, in which not long ſince was found a long Altar, but its Inſcription is defaced: As alſo a leſſer Stone, with this Word HAVE, not on the Front, but on one Side. There is another, (which is uſed as a Grave-ſtone) it lies before the Church-Door, which, by the engraving of a Man from the Breaſt upwards in a *Roman* Dreſs, ſeems to have been *Roman*. Theſe are all the Stones I can meet with, that have ever had any *Roman* Inſcription. I enquired of the Inhabitants concerning what had been found there whilſt they digged up the Ruins of this Place, who told me they had dug up many Inſcriptions, but broke them: And they add, that in moſt Places they plainly diſcern two different Foundations of ruined Houſes; and moſt Stones thus dug up are ting'd of a deep red Colour, undoubtedly by Fire. That Part of the Village which ſtands within the Walls, is called the *Mains*, and there are the moſt Ruins: Here are many Tiles dug up of a red Clay, but not one entire.

About twenty Years ago, ſome began to undermine an old Foundation ſtill viſible on a Hill-ſide, and after they made a ſmall Progreſs, found a conſiderable Quantity of a melted Metal, which at firſt View they ſuppoſed had been Silver; but upon a ſecond Examination, it proved to be no more than Pewter.

Watling-ſtreet paſſes by this Place about a hundred Yards to the Weſt: For it could not conveniently be brought through the Town without a tenfold Charge, by reaſon of a Brook two or three hundred Yards to the South, whoſe Banks are not a little uneven, and the above-mention'd ſteep Hill towards the North makes a Paſſage that way next to impoſſible.

I can meet with no certainty whether the *Romans* have had a Bridge over *Derwent* at *Ebcheſter*; but the Affirmative ſeems to me more reaſonable, both from the Number of Soldiers who muſt needs have paſſed that way, as alſo from the conſiderable Largeneſs of this River.

The Paſſage in the ſecond Book of *Ptolemy*'s Geography, *Sub Elgovis & Olludinis ad utraque Maria habitant Brigantes, in quibus Urbes Epiacum, Vinnovium, Caturactonium; Calatum, Iſurium, Rhigodunum, Olicana, Eboracum*; ſeems to perſuade me that this may probably have been *Epiacum* of the *Romans*, eſpecially if it can be granted that this Author mentions only the Places in the Eaſtern Parts of this Province (and only *Epiacum*, if placed at *Papcaſtle*, and *Rhigodunum*, if at *Ribcheſter*, thwart this Aſſertion.) And indeed I am apt to believe that *Ptolemy* begins his Enumeration of the Places among the *Brigantes* at the Place neareſt *Hadrian*'s Wall, and has advanced in Order, (tho' with ſome Omiſſions) to *Eboracum*, the chief Town in the Province: And further, the modern Name *Ebcheſter* agrees as well with *Epiacum* as *Papcaſtle* does; for all know the Mutation of P into B to be a thing not unuſual.

Some

Fig. 6.

Some of the Inſcriptions are not very perfect, and moſt of the Words in that mark'd *Fig.* 6. are ſo artificially eraſed, that I am apt to believe it has been thus defaced upon ſome Revolution in the *Roman* Government. This (with ſeveral more, beautify'd with Inſcriptions and Engraving, but which are now taken away) was dug up ſome time ago in a Field called the *Bower*; it is about half way between the *Roman* Wall and South *Tine*, and is near two Miles Weſt from *Buſy-gap*: Here has been a *Roman* Garriſon kept; it has been ſurrounded with a ſingle Wall, and is ſquare; 'tis nothing now but Heaps of Stones, overgrown with Buſhes.

Some Years ago, on the Weſt Side of this Place, about fifty Yards from the Walls thereof, there was diſcover'd under a Heap of Rubbiſh, a ſquare Room ſtrongly vaulted above, and paved with large ſquare Stones ſet in Lime; and under this a lower Room, whoſe Roof was ſupported by Rows of ſquare Pillars of about half a Yard high: The upper Room had two Niches, like (and perhaps in the nature of) Chimneys on each ſide of every Corner or Square, which in all made the Number ſixteen; the Pavement of this Room, as alſo its Roof, were tinged black with Smoke. The Stones uſed in vaulting the upper Room have been marked as our Joiners do the Deals for Chambers; thoſe I ſaw were number'd thus, X. XI. XIII.

Fig. 7.
Fig. 8.
Fig. 9, 10.
Fig. 11, 12.
Fig. 13, 14.
Vid. infra, S. xv. *and* Fig. 15.

The other Inſcriptions were all found near the *Houſeſteads*, a Place ſo call'd from the Abundance of Ruins; this is about half a Mile from *Buſy-gap* towards the Weſt, and is placed juſt within the *Roman* Wall: Among the Ruins I found ſeveral Pedeſtals, two or three Pillars, two Images, but ſomewhat defaced. The Stone, *Fig.* 7, lies againſt a Hedge a quarter of a Mile from this Place. That marked *Fig.* 8. is only Part of an Altar. The two Altars, *Fig.* 9, and 10. are very legible; I found them on a riſing Ground South of the *Houſeſteads*; they call it *Chapel-hill*, and ſuppoſe a Foundation, which is viſible there, to have been a Chapel; and ſay that within the Memory of their Fathers they uſed to bury their Dead here. *Fig.* 11 and 12. are the Sides of the Altars. I found *Watlingſtreet* very viſible from near *Ebcheſter* almoſt to *Corbridge*, which is about ſeven Miles: Here, beyond Expectation, I met with the Altar marked *Fig.* 13. with its Sides, *Fig.* 14. on the Top it is hollow at leaſt eight Inches deep. The Inſcription is all legible, except the ſecond and laſt Letters in the firſt Line, the ſecond and third in the third Line, and the third in the laſt, which are a little doubtful; the Altar is at preſent in the Church-yard, it has been there a long time.

Fig. 16.

The Fragment, *Fig.* 16. I found in the Front of a Houſe in the ſame Town; it is ſtill ſufficient to ſhew the real Value which ought to have been ſet upon the Inſcription, if it had been entire: I was very ſenſible at firſt View that Hiſtory would receive ſome Light from this, if perfect.

From

From hence I travell'd upon this Street almoſt to *Reſingham*; it is very viſible all this Way. About a Mile ſouth from *Reſingham* there is a Pillar of about eight Foot in Length, which has ſtood by the Way-ſide, but is now fallen. At this Place I was ſhewn the Inſcription in a Wall on the Inſide of a Houſe. I got a Medal which was found here a Year ago, 'tis a Braſs one; the Emperor's Name worn out, AVG PIVS very legible; but by the Figures of other Medals I take it to be *Antoninus*; on the Reverſe a Wolf, without any Inſcription.

Fig. 17.

The next *Roman* Town I viſited was *Rocheſter*; *Watling-ſtreet* is very viſible ſome Part of it, but how far I cannot tell, not having traced it. I found the Altar, *Fig.* 18. near this Place. I cannot ſay this is the largeſt, but think it has been one of the beſt fortified Places the *Romans* have been Maſters of in the North: And indeed it ſtood in need of being ſo, ſince it was not only a Frontier Town, but alſo ſurrounded by Enemies.

Fig. 18.

From this Place I return'd to the *Roman* Wall at *Carrow*, between which and *Walwich* the Wall has been repair'd, and fronted with its old Stones again, upon which I found the Inſcriptions, *Fig.* 19, 20, 21, 22, 23, 24, 25, 26.

Fig. 19, 20, 21, 22, 23, 24, 25, 26.

XV. I have endeavoured to get what Account I could of the Truth of a Relation, which was ſent up to the *Athenian Society*, of the entire Skeleton of a prodigious Monſter, of human Form, above 22 Foot in Length; which was diſcover'd upon the Banks of the River *Tyne*, not far from *Corbridge* in *Northumberland*. I ſhall give an Account, *Firſt*, Of the Place itſelf, and of the Antiquities that are there. *Secondly*, Of the Bones and Teeth, which are diſcover'd there, and ſaid to be of ſo prodigious a Bigneſs. *Thirdly*, I ſhall offer my Thoughts of the Matter.

Antiquities at Corbridge *in* Northumberland, *by Dr.* H. Todd. *n.* 330. *p.* 291.

Firſt, The Place where the Bones were found is not *Corbridge*, but *Colcheſter*, a Mile Weſt of it, upon the N. Banks of the River *Tyne*: Formerly a *Roman* Colony; but, at preſent, a Field of Corn; nothing of Antiquity remaining, but ſome Walls and Rubbiſh; which ſhew it to have been a very large Fortreſs. Stones, which have been dug up, with Figures and Inſcriptions upon them, have been all remov'd to *Corbridge*, which has riſen out of its Ruins. There I ſaw Altars inſcrib'd; one IMP. M. AVRELIO . . . . another LEG. II. AVG. COH. IIII. But that which is moſt remarkable, is that which ſtands in a Corner of the Church-yard, dedicated to *Hercules*, in old Capital *Greek* Characters; the like to which is not to be met with, I think, in any other Part of this Iſland. The Characters are indifferent plain, and, as I could read them, thus: *Fig.* 15. i. e. *Herculi Tyrio Divina Dona, Archi-Sacerdotalia*; vel, *per Summum Sacerdotem offerenda*. The Altar ſeems to have been erected by ſome of the *Aſiatick*, *Phœnician* Auxiliaries, who might be in Gariſon here, near the Frontier, under *Urbicus Lollius*, in the Time of *M. Aur. Antoninus*, about *A. D.* 140. The

An Altar to Hercules.

Fig. 15. *and Vid.* ſupra, Fig. 13.

Altar is very large, hollow at the Top (as uſual) for Incenſe. On the Sides are engrav'd a Bull's Head, with Garlands and ſacrificing Inſtruments.

Secondly, The Teeth and Bones, which were diſcover'd by the River *Tyne*'s breaking in upon the Bank, were found near the Foundations of the old Fort; and neither higher up, nor lower down, than the Ruins of it ſeem to reach. I examin'd the Perſon who made the firſt Diſcovery, and was as exact as poſſible in the Remarks which I made myſelf upon the Spot. Upon the whole, it appear'd to me that there never was an entire Skeleton found in that Place. The Teeth and Bones lie in the Bank in *Strata's*; ſometimes at one, ſometimes at two Yards depth, for above 200 Yards in length. In ſome Places there appears to have been a ſort of Pavement, or Foundation of Stone, which runs along with the Bones, *ſtratum ſuper ſtratum*; ſometimes above, ſometimes below them. The Bones are of different Sizes; the Teeth, which are moſt perfect and entire, are very large, ſome three or four Inches in Compaſs; Ribs, Shank-bones, *&c.* (many of them) not exceeding the ordinary Dimenſions of thoſe of Sheep and Oxen. I could meet with no Remains of Horns, thoſe being more eaſily corrupted than the Bones, which are of a harder Subſtance. The Teeth look as if they were human; but I cannot affirm them to be ſo: And they lie ſometimes at ſo great a Diſtance from the Ribs and Shank-bones, that ſhould any one compute the Length of the Monſter, from one to the other, they might calculate his Longitude to 200 or 300 Yards, as reaſonably as to 22 Foot. The Teeth and Bones are in ſuch Quantities, that, with the Help of a Labourer or two, you might in a few Hours gather a Buſhel of them.

Thirdly, From the Account I have given, it may not be unreaſonable to infer, that the Altar here dedicated to the *Tyrian Hercules* was very famous, and much frequented; that Oxen and ſuch like Creatures, as Biſons and Bonaſſus, (with which the Country hereabouts did anciently abound; the entire Head and Horns of one, being lately dug up in a marſhy Ground, reſembling exactly thoſe Creatures, as they are deſcrib'd by *Geſner* and others) were ſacrificed thereon: And, that their Bones being all thrown together, and, according to the Superſtition of thoſe Times, laid under the Foundation and Pavement of the Fort, are the very ſame Bones, Teeth, Skulls, Ribs, *&c.* which, by the River's waſhing away the Bank, are now diſcover'd and brought to light. And, if I might be allow'd to gueſs a little farther, I might think it not impoſſible, that (as *Erkelens* in *Gelderland* is *Herculis Caſtra*, and *Hertland* in *Cornwall* was *Herculis Promontorium*, ſo) upon the Receſs of the *Romans*, the *Saxons* who ſucceeded them might call this noted Station *Hercul-ceaſter*, and by Corruption, *Colceaſter*, or *Colcheſter*, its modern Name. And, what may ſomewhat confirm the Conjecture, the ancient Town of *Corbridge*, which, as I ſaid, has riſen out of its Ruins, is called in the Charter of *Henry* I. (whereby that King gave it to the Secular Canons of *Carliſle* before the Erection either of the Priory or Biſhoprick, *Colbruge* and *Colburgh*, the ſame as *Col-ceaſter*; the Bridge, from whence it may ſeem to take its Denomination, being of a much later Erection. That Oxen uſed to be ſacrificed to *Hercules*, there needs no other Evidence than the Altar itſelf; whereon an Ox's Head, with ſacrificing Inſtruments, are delineated.

As to the Teeth and Bones, if it does not appear that they agree perfectly with the Teeth and Bones of Oxen, it will not follow, that therefore they muſt be Human, and that there were Men of prodigious Stature who made uſe of them; ſeeing there were in theſe Parts other Creatures of very great Size, to whom they might belong, and of whoſe Teeth and Bones we have now very few Specimens to compare them with.

A Roman Inſcription *near* Lancheſter, *by Dr.* C. Hunter. n. 354. p. 701. Fig. 28.

XVI. 1.] The Inſcription, *Fig.* 28. was dug up two Years ago in the *Roman CASTRUM*, near *Lancheſter:* The Inſcription is very legible, and gives me Reaſon to hope a Search after the firſt fortifying this Place will not be unneceſſary, eſpecially being able to fix the Time of *Gordian's* repairing this Fortreſs to the 243d Year of CHRIST. We may reaſonably aſcribe the Foundation to the prudent Adminiſtration of *Julius Agricola*, in the Reign of *Fl. Veſpaſian*, about 169 Years before.

In the ſecond Year of the Emperor *CLAUDIUS*, *An. Dom.* 44. the *Romans* invaded *Britain*, under the Command of *Aulus Plautius*, in which Expedition *Veſpaſian* [*], then Legate of the ſecond Legion, made a glorious Figure, having been engaged in no leſs than thirty Battles, and reduced two powerful Provinces, above twenty Towns, and the Iſle of *Wight*. All theſe Succeſſes, though continued with good Improvements in ſome of the following Years and Governments, could not frighten the Natives into an entire Submiſſion, eſpecially no Advance being made into the Country of the *Brigantes*, till the Advancement of *Veſpaſian* to the Imperial Throne, about 26 Years after, *An. Dom.* 70. Then the whole Empire was deliver'd from the Miſeries of *Nero's*, and the ſhort, but lamentable Devaſtations of the three ſucceeding Reigns: *Veſpaſian* then reſolved to puſh on his begun Conqueſts in *Britain*; choice Armies, commanded by Experienced Generals, are ſent over; and the 20th Legion, having in the preceding Troubles acted ſeditiouſly, (not without difficulty) was reduced to ſubmit to *Veſpaſian* (moſt of the Officers as well as Soldiers having been advanced by *Vitellius.*) *Julius Agricola* is conſtituted Legate, who, under the Governor *Petilius Cerealis*, bore a conſiderable Share in the Succeſſes againſt the *Brigantes*; [†] "Sed primò *Cerealis* modò labores & diſcrimina, mox & gloriam communicabat: Sæpe parti "Exercitus in experimentum, aliquando majoribus copiis ex eventu "præfecit." *Tacitus* afterwards in a few Words ſums up the whole of

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[*] *Suetonius*, *Veſpaſian*, cap. iv.

[†] *Tacit. Vit. Agric.* viii.

Cerealis's Acquiſitions, ‖ "Terrorem ſtatim intulit *Petilius Cerealis*; "*Brigantum* Civitatem, quæ numeroſiſſima Provinciæ totius perhibe"tur, aggreſſus; multa prælia, & aliquando non incruenta; mag"namque *Brigantum* partem aut victoria amplexus, aut bello." Notwithſtanding theſe Advantages, I dare not ſuppoſe the *Romans* to have then penetrated ſo far into this Province as our *Longovicum*, which is ſituate ſo near the Northern Bounds of the *Brigantes*, that at preſent it is not diſtant above twelve Miles from *Corbridge*, the *Roman Curia*, the chief Town of the adjoining People the *Otadini*. I now advance to my principal Motive, (being under no Obligation to account for the Government of *Jul. Frontinus*, Succeſſor to *Cerealis*) to fix upon the ſecond Year of *Julius Agricola*'s Government for this Work, which *Tacitus* thus deſcribes: * "Sed ubi Æſtas advenit contracto Exercitu "——loca Caſtris ipſe capere, æſtuaria ac ſylvas ipſe prætentare: "& nihil interim apud Hoſtes quietum pati, quo minus ſubitis Ex"curſibus popularetur; atque ubi ſatis terruerat, parcendo rurſus "irritamenta Pacis oſtentare. Quibus rebus multæ Civitates quæ in "illum diem ex æquo egerant, datis Obſidibus iram poſuere, & Præ"ſidiis Caſtelliſque circumdatæ, tantâ ratione curâque, ut nulla antè "Britanniæ nova pars illaceſſita tranſierit." This excellent Conduct *Tacitus* further confirms from the Obſervation of others. "Adnota"bant periti, non alium Ducem Opportunitates locorum ſapientius "legiſſe, nullum ab *Agricola* poſitum Caſtellum aut vi Hoſtium ex"pugnatum, aut pactione aut fugâ deſertum."

Agricola, this Summer, having quieted ſo large a Tract, and finiſhed ſo many Fortreſſes, it cannot be expected all ſhould be built with the moſt exquiſite Art, ſufficient to perpetuate them. I proceed to *Gordian*'s Repairs; whoſe Hiſtorian, *Julius Capitolinus*, having never once named *Britain*, yet giving ſo many Hints of the excellent Oeconomy of his Government, under the prudent Adminiſtration of his Father-in-Law *Miſitheus*, I dare not fix this Work till the third Year of his Reign, he having before been under the Direction of the Eunuchs and Officers of the Court, whom *Capitolinus* repreſents in *Miſitheus*'s Letter to *Gordian*, to have proſtituted all Employments to their own Covetouſneſs and mercenary Creatures.

—on the ſame *by Mr.* R. Gale. *n.* 357. *p.* 823.

2.] Dr. *Hunter* having only given us his Conjectures as to the firſt fortifying the Place where it was found, and the Time of its Repair after it had been deſtroyed, but ſaid nothing relating to the Explanation of the Inſcription itſelf, I ſhall offer ſome Thoughts that occur'd to me at firſt Sight of it. I ſhall not diſpute or call in queſtion the Time of its Foundation, as fix'd by the Doctor, but begin with the Place where it was diſcover'd, namely, *Lancheſter*, or *Lancaſter*, in the Biſhoprick of *Durham*; which I am, with him, fully perſuaded was the *Longovicus*, where the *Notitia Imperii* places the † *Numerus Longovicariorum*.

This Place is ſeated upon a great Military Way, about twelve Miles diſtance from *Bincheſter*; and ſeven from *Ebcheſter*; the one the

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‖ cap. xvii. * cap. xx. † *Not. Imp.* fol. 176.

Vinovia, and the other the *Vindomora* of *Antoninus*, as the Correſpondence of the Numbers may evince; *Bincheſter* being 19 *Roman* Miles from *Ebcheſter*, as that is 9 from *Corbridge*, the exact Numbers the *Itinerary* gives us between *Vinovia*, *Vindomora*, and *Corſtopitum*. What is very ſtrange, is, that the *Itinerary*, which muſt go upon the great Road directly through this Town of *Longovicus* betwixt *Vindomora* and *Vinovia*, takes not the leaſt notice of it, but meaſures the Way at the whole Length, and Number of Miles, from the firſt to the latter of thoſe Stations. If *Longovicus* was founded, as Dr. *Hunter* ſuppoſes, ſo early as the Time of *Julius Agricola*, and if that *Itinerary* was compoſed by any of the Emperors that bore the Name of *Antoninus*, this Station might have been deſtroyed or deſerted during the Wars with the *Britons*, and not being repair'd till the Reign of *Gordian* III. was paſſed over by the Author of the *Itinerary*, as a Camp not then in being, or of no uſe to the *Roman* Armies; and this would be no weak Argument for the Antiquity of that Work: And perhaps ſome Parts of it may have been deſcribed as early as the Reigns of thoſe Emperors, or earlier, and ſuch Names of more modern Places as are found in it, may have been afterwards added, as Occaſion required. As a farther Confirmation of this Conjecture, I obſerve, that this Place, after it was repaired by *Gordian*, ſubſiſted even to the Ruin of the *Roman* Empire in *Britain*, as is evident by the mention of it in the *Notitia Imperii*; ſo that had this * Journey, which carries us from *Vindomora* to *Vinovia*, been compoſed after the Reign of *Gordian*, it would be very hard to account for the Omiſſion of this remarkable Station and Town, as it appears to have been from this, and many other Inſcriptions found there.

I take this Opportunity to rectify a Miſtake in the *Eſſay towards the Recovery of the* Roman *High-ways through* Britain, printed in the 9th Volume of Mr. *Hearne's Itinerary of Leland* †, which having brought the *Erming-ſtreet* (not the *Watling-ſtreet*, as Dr. *Hunter* and the Country call it) a little beyond *Cattarick* in *Yorkſhire*, divides it there into two Branches, tracing one of them to *Tinmouth*, and the other to *Carliſle*; but omits the main Stem of it, that runs almoſt directly northward to *Piercebridge*, ſo to *Denton*, *Haughton*, *Bincheſter*, *Lancheſter*, *Ebcheſter*, *Corbridge*, and through the Heart of *Northumberland* into *Scotland*, about a Mile and a half to the Weſt of *Berwick*. It is in ſeveral Places very entire and fair, eſpecially between *Corbridge* and *Bincheſter*, the Ridge of it there being for the moſt part two Yards in height above the Level of the Soil, no leſs than eight Yards broad, and all paved with Stones, that are as even as if new laid, as I am inform'd by Mr. *Warburton*, who has often viewed it.

Having fix'd the Seat of this *Longovicus*, where the Inſcription was found, let us conſider next what ſort of a Place it was; and upon due Enquiry it will appear to have been one of the moſt ancient and

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[*] *Iter I. a Limite Prætor. uſque.*

[†] Page 111, 114.

eminent Stations the *Romans* were poſſeſſed of in theſe Parts. As to its Antiquity, Dr. *Hunter* has made it probable, that we ought to look for it as high as *Julius Agricola*'s commanding under *Domitian*, in this Iſland: As to its Eminency, the Inſcription that came laſt from him to the Society, as well as ſeveral others found there, is an undeniable Evidence of its being a Place of great Conſideration; but nothing can put that more out of diſpute than the *firſt*, which was ſome Years ago tranſmitted by the ſame Hand *, which I ſhall inſert here with that which came laſt from him; and the rather, becauſe little or nothing has ever been ſaid upon it, and that they will give great Light one to the other.

* *Vid.* ſupra, V. iii. C. ii. S. xxi.

Fig. 27. The Stone whereon the firſt is cut, has been broke in two, whereby ſome of the Letters are defaced; however, it may be very well read as follows: The Letters PRE in the fourth Line I take to be a Miſtake of the Workman, having ſeen ſeveral Copies where they are ſo tranſcribed; that they ſhould be PER, is evident from the fifth Line of the Inſcription, *Fig.* 28.

Fig. 27.

Imperator Cæſar Marcus Antonius Gordianus
Pius Felix Auguſtus Balneum cum
Baſilica a ſolo inſtruxit
Per Cneium Lucilianum Legatum Auguſtalem
Proprætorem curante Marco Aurelio
Quirino Præfecto Cobortis primæ Longovicariorum; or rather, *Legionis Gordianæ.*

The next can be read only after the following manner:

Fig. 28.

Imperator Cæſar Marcus Antonius
Gordianus Pius Felix Auguſtus
Principia & Armamentaria
Conlapſa reſtituit
Per Mæcilium Fuſcum Legatum
Auguſtalem Proprætorem curante Marco Aurelio
Quirino Præfecto Cobortis primæ Legionis Gordianæ.

From theſe two Inſcriptions compared together, it will be apparent that they were not only erected under the ſame Emperor, but by the Care of the very ſame Perſon *Aurelius Quirinus*, though not in the ſame Year. The Emperor can be no other than *Gordianus* the youngeſt, or third of that Name; the two former having been ſlain ſo very ſoon after they had aſſumed the Purple, that it is improbable they ſhould have given any Orders or Commands for the erecting of new, and repairing of ancient Buildings, in ſo remote a Province as *Britain* was from *Africa*, where they were murdered after a ſhort joint Reign of ſcarce ſeven Weeks.

* Dr. *Hunter* tells us, that the firſt was dug up about a hundred Yards Eaſt from a great Square, which had been fortified with a thick, ſtrong Wall, faced with hewn Stone, within which, and without, eſpecially towards the Eaſt, are nothing but ruinous Heaps of Stone; and thinks the Lodging of the Gariſon only to have been included within thoſe Walls. His Conjecture is very much confirmed by the Accounts he gives us of, the finding the laſt Inſcription within that ſquare Incloſure; ſo that there ſeems to have been at this *Longovicus* a large Town, and one of thoſe Camps called *Caſtra ſtativa*, where the Legions lay in Quarters during the Time of Peace and Quiet.

The firſt Inſcription tells us, that the Emperor *Gordian* built the *Balneum* and *Baſilica* from the Ground, *à Solo*; whereas, by the ſecond he appears to have been only the Repairer of the *Principia* and *Armamentaria*. Perhaps therefore here might be no Town, till the *Romans* thought fit to repair their old deſerted Camp at this Place, and then the Emperor might alſo build the *Bath* and Palace for the Reſidence of the *Proprætor*, when in theſe Parts of *Britain*; the word *Baſilica* importing both a Palace, and an Edifice for hearing of Cauſes, and tranſacting all publick Affairs. As this eminent Building was erected by the Emperor's Command, it is an undeniable Argument of the Splendor of this Town, as are the great Heaps of Rubbiſh and Ruins, where this Inſcription was found, of its Largeneſs and Extent.

The ſecond equally puts the Being of the *Caſtrum ſtativum* out of diſpute, when it acquaints us with the Rebuilding of the *Armamentaria* and *Principia* there; that is, the *Arſenals* and *Quarters* either of the Legionary Soldiers that were called the *Principes*, or the Place where the Eagles and other military Enſigns were kept. It is probable they did not belong to one particular Legion, but to ſeveral, as they had Occaſion to be employed here; though the † *Legio ſexta Victrix* ſeems to have the beſt Title to them, as being conſtantly quarter'd in the North; whereas the ‖ *Legio Secunda* and ‡ *Viceſima* were generally gariſon'd, the firſt at *Caerleon* in *Wales* and *Richburrow* in *Kent*, and the other at and about *Cheſter*; ſo that the ** Monuments they have left in the North were erected by them when the Wars, and other Works, as particularly the *Walls* carried croſs the Iſland, called them thither; which being finiſhed, they returned home to their more Southern Quarters, and continued in them till commanded abroad upon new Services. I will not pretend to determine when theſe *Armamentaria* and *Principia* firſt fell to Ruin; perhaps it might be when *Hadrian*, *Lollius Urbicus* and *Severus* had carried their Conqueſts farther into the Enemy's Country, and having built thoſe famous *Walls*, the Relicks of which we ſtill ſee in the Shire of *Sterling* in *Scotland*, and in *Northumberland* and *Cumberland* in *England*, that this Camp might be thought uſeleſs, the *Roman* Forces being drawn nearer to, and quartered upon the Frontiers; and ſo this Fortreſs was abandoned and ſuffered to fall into Decay, as the word *Conlapſa* implies; and not that it was deſtroyed by any Fire, War, or other Enemy, than Age and Neglect.

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* *Phil. Tranſ.* Nº 266. p. 658.

† *Ptol. Leg.* VI. *Niceph. Ebor. locat.* ‖ *Anton. Itin.* XII. *Not. Imp.* p. 161.

‡ *Anton. Itin.* II. ** *Camd.* p. 835, 920. *Phil. Tranſ.* Nº 269.

Tho' the word *Conlapſa* is wrote here with an *N*, there can be no doubt, but the Pronunciation of it was, as we uſually find it ſpelt, *Collapſa*; a certain Argument of the Letter *N*'s being ſilent in the middle of a Word before two Conſonants, eſpecially *NS*, and *NT*, when the *T* was pronounced like an *S*. To omit what * *Quintilian* ſays to this Purpoſe, it is confirm'd by the Abſence of that Letter in numberleſs Inſcriptions in *Gruter*, *Reineſius*, *&c.* and no wonder, ſince the Workmen in thoſe Days, as well as ours, uſually wrote as they ſpoke their Words. I ſhall not trouble you with Quotations of any of them to this End; but, as a Proof of what I ſay, only aſſure you from ocular Inſpection and a moſt accurate Examination, that there is no tranſverſe Line over the Letters E S belonging to the word FABRIGESIS in the Inſcription of IVL. VITALIS at *Bath*, whatever has been affirm'd to the contrary, but that the Letter N is totally omitted there. I ſhall endeavour to explain a ſhort Inſcription belonging to ſome of our Countrymen, though found at *Amerbach* in *Germany* †, ſince it will be a new Proof of the foregoing Aſſertion.

NYMPHIS ❧	*Nymphis.*
N ❧ BRITTON	*Numerus Brittonum*
TRIPVTIEN	*Triputienſis*, or ——— *enus*
SVB CVRA ❧	*Sub cura*
M ❧ VLPI	*Marci Ulpii*
MALCHI ❧	*Malchi*
▸ LEG XXII	*Centurionis Leg.* 22.
PR ❧ P ❧ F ❧	*Primigeniæ, Piæ, Felicis.*

There is no Difficulty but in the word TRIPVTIEN, and that will preſently vaniſh if you inſert the Letter N, and read it TRIPVNT, i. e. *Tripontienus* or *Tripontienſis*, the Mutation of the O and V being frequent. This will bring you to *Tripontium* ‖ or *Dowbridge* in *Northamptonſhire*; though Dr. *Battley*, in his ‡ *Antiquitates Rutupinæ*, would read it RIPVTIEN, and fix'd the Place whence this *Numerus* took its Appellation at *Richburrow* in *Kent*.

But to return to the Camp at *Longovicus*, it will be as difficult to aſſign a Reaſon for its being repaired, as it was for its being deſerted; unleſs that the *Proprætors* might judge it adviſeable about the Time of *Gordian* III. to fix their Reſidence there, and conſequently refortify the old Camp for their State and Security. And that it was not refortified upon any ſudden Emergency, but for Time and Duration, is evident both for the ſtrong Stone-works that encompaſſed it, and a Body of Forces lying here, even at the Expiration of the *Roman* Empire and Authority in this Iſland, which from its Continuance in the ſame Station, had got the Name of the *Longovicarii* *.

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* *Quintil. Inſtit.* Lib. I. c. 7. † *Gruter.* p. xciii. ‖ *Antonin. Itin.* VI. ‡ P. 21.

The Perſon that under the Emperor gave Direction for theſe Repairs was *Mæcilius Fuſcus*: As *Mæcilius* is a Diminutive of *Mæcius*, it is not unlikely that he was the Son of *Mæcius Fuſcus*, who was Conſul with *Turpilius Dexter*, *A. D.* 225. in the Reign of *Alexander Severus*: By this Inſcription it appears that this *Mæcilius* was the Emperor *Gordian*'s *Lieutenant* here, and *Proprætor*. And as the Name of *Fuſcus* ſtands in the ſame Place in the 28th *Fig.* as that of *Lucilianus* does in the 27th *Fig.* and with the ſame Adjuncts both before and after, we may fairly conclude he was either his Predeceſſor, or Succeſſor; but which, it is impoſſible to determine.

And here it may be remarked, we never meet with a *Legatus Auguſtalis* in any Inſcription in this Iſland, without the joint Title of *Proprætor*; and † *Tacitus* himſelf either makes them the ſame Office, or at leaſt unites them in the ſame Perſon, when he tells us, *In Britannia P. Oſtorium Proprætorem turpidæ res excepere*: and having preſently after related the Manner of the Fight with the *Iceni*, ſtiles him *Legatus*, *Quâ pugnâ filius Legati, M. Oſtorius, ſervati civis decus meruit* ‖; and a little after he gives both the ſame Titles to *A. Didius* the Succeſſor of *Oſtorius*.

Theſe two Monuments have given us an Account of the *Roman* Arms and Magnificence at *Longovicus*, and the Names of two *Legates* and *Proprætors* of *Britain*, that would otherwiſe have been buried in Oblivion, *viz. Cneius Lucilianus* and *Mæcilius Fuſcus*: For from *Virius Lupus* (who was *Proprætor* and *Legate* here about the Year 208, under *Severus*, and juſt before that Emperor's coming into this Iſland, repaired a Bath burnt down at *Lavatræ*, or *Bowes* ‡, in *Yorkſhire*) we have no where extant the Name of one of thoſe Officers, till we come to *Nonnius Philippus*, whom I take to have ſucceeded the laſt of theſe; the ∴ Stone which was found at *Old Carliſle* in *Cumberland*, and has preſerv'd his Memory, ſetting forth that he was *Legate* and *Proprætor* when *Atticus* and *Prætextatus* were *Conſuls*, which was *A. D.* 242. the very Year that our *Gordian* went upon his *Perſian* Expedition, from which he never return'd. And as that Emperor left *Nonnius Philippus* in that Poſt, when he marched into the Eaſt, where he was murdered about two Years after, it is highly probable that he was the laſt *Proprætor* of his appointing, and conſequently, that *Mæcilius Fuſcus* was his Predeceſſor, and the Repairs begun at *Longovicus* before the Year 243. This Inſcription is faultily tranſcribed in *Cambden*.

I. O. M.

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* *Notit. Imp.* fol. 176. b. † *Tac. Lib.* An. XII. c. 32. ‖ Ibid. c. 39.

‡ *Cambd.* p. 762. Edit. 1695. ∴ *Cambd. Britan.* p. 830.

I. O. M.
PRO. SALVTE. IMPERATORIS
M. ANTONI. GORDIANI. P. F.
INVICTI. AVG. ET. SABINE. FvR
IE. TRANQVILE. CONIVGI. EIVS. TO
TAQVE. DOMV. DIVIN. EORUM. A
LA. AVG. GORDIA. OB VIRTVTEM
APPELLAT. POSVIT. CVI. PRAEEST
AIMILIVS. CRISPINVS. PREF
EQQ. NATVS. IN. PRO. AFRICA DE
TVSDRO. SVB. CVR. NONNII. PHI
LIPPI. LEG. AVG. PROPRETO.
ATTICO. ET. PRETEXTATO COSS.

The Perſon, who had the Care of theſe Repairs both in Town and Camp, was *Marcus Aurelius Quirinus*, *Præfect* or *Commander* of a Company of Foot; another Argument for the Proprætors *Lucilianus* and *Fuſcus* ſucceeding immediately one the other, he ſerving in the ſame Poſt under both. I muſt obſerve, however, that altho' the * two firſt * Fig. 27, 28. Inſcriptions have been cut very near the ſame time, and by the ſame Hand, as appears by the Form of the Letters, and Manner of the Abbreviations in each of them; yet the Office that this *Quirinus* bore, is ſomething differently expreſs'd in the firſt from what it is in the ſecond, † Fig. 27. if they have been accurately tranſcrib'd; the firſt ſhewing † after *QVIRINO* the Letters PRE. CH. I. LG. R. which, before I had ſeen the latter, I was induced to read *Præfecto Cohortis primæ Longovicariorum*, the ‖ *Notitia Imperii* placing the *Præfectus numeri Longovicariorum Longovico.* That *Numerus* and *Cohors* were the ſame thing, *Pancirollus* ‡, in his Notes upon that Book, quotes St. *Chryſoſtom* to prove, and ſome others, *Cohors orat qui vocatur Numerus*; but I rather take it to be an indefinite Number of Men, which might comprize ſeveral Companies independent of any Legion. ** *Vegetius*, ſpeaking of the *Legati Imperatoris*, ſays, *In quorum locum nunc illuſtres viros conſtat Magiſtros Militum ſubſtitutos, à quibus non tantum binæ Legiones, ſed plures Numeri gubernantur*; by which it is plain, the *Numeri* were no *Legionary Cohorts.* Neither was the Name ſo modern as from the *Notitia Imperii* and *Chryſoſtom* it might appear to be; for we meet with a †† *Numerus Britonum* upon an Altar found in *Tranſylvania*, dedicated to the *Nymphs*, when the Emperor *Commodus* and *Glabrio* were Conſuls, *A. D.* 186. And ‖‖ another *Numerus* upon an Altar erected to *Hercules* for the Proſperity of *Septimius Severus*, when *Lateranus* and *Rufinus* were Conſuls, *A. D.* 197. But after I had review'd the Letters at the End of the ſecond Inſcription, which are plainly tranſcribed PR. CoH. I. L. COR. I could read them no otherwiſe than *Præfecto Cohortis*

‖ Fol. 266. b. ‡ Fol. 16. b. ** Lib. II. c. 9. †† Gruter. p. 942. ‖‖ Id. 6. 46.

primæ Legionis Gordianæ. Gordian III. was ſo belov'd of the Soldiery, that ſeveral Legions complimented him by honouring themſelves with his Name, as the [*] *Legio tertia Italica*, which took the Addition of *Gordiana*; and the [†] *Legio decima gemina*, and [‖] *Decima tertia gemina*, did both give themſelves the ſame Appellation. But which of the Legions quartered in this Iſland ſo ſtiled itſelf, is not determin'd by this Inſcription, or any other that I know of. However, as the *Legio ſexta Victrix* was all along quarter'd in the Northern Parts of this Kingdom, where theſe Inſcriptions were erected, I make no doubt but it was that which called itſelf *Gordiana*, though the numeral Diſtinction of VI is omitted, only perhaps for want of room on the Stone. We find by ſeveral Inſcriptions in *Cambden*, that there was an *Ala* in thoſe Parts which prided itſelf upon its Valour, and was therefore call'd the *Ala Auguſta*. Of the many Memorials it has left us of its Title, I ſhall only mention [‡] one found at *Old Carliſle*, and which is the ancienteſt of them all, by any Certainty of Date.

I. O. M.
AL. AVG. OB
...RTVT. APPEL. CVI
PRAEEST. TIB. CL. TIB. F. P.
LING.. N. IVSTINVS.
PRAEF. FVSCIANO.
II. SILANO. II. COS.

That is, *Jovi Optimo Maximo, Ala Auguſta ob Virtutem appellata, cui præeſt Tiberius Claudius Tiberii filius, provincia Lingonenſi, Juſtinus Præfectus, Fuſciano ſecundo, Silano ſecundo Conſulibus.*

This Altar was dedicated when *Fuſcianus* and *Silanus* were the ſecond time Conſuls, that is, in the Year 188. under the Reign of *Commodus*, and fifty Years before our *Gordian* came to the Empire. At the ſame Place was alſo diſcover'd the Inſcription, *p.* 56. where we find this ſame *Ala Auguſta* ſtiling itſelf alſo *Gordiana*; from whence I think it is not a little probable, that the Legion, to which this Wing appertain'd, was the *Legio Gordiana* mention'd in the Inſcriptions found at *Langcheſter*; and that Legion to have been the *Legio ſexta Victrix*, from the long Continuation of this *Ala Auguſta* in theſe Northern Parts of the Nation, the conſtant Quarters of that Legion.

Roman, French, *and* Iriſh *Inſcriptions and Antiquities in* Scotland *and* Ireland, *by* Mr. Edw. Lhwyd. *n.* 269. *p.* 790.

Fig 29.

XVII. A *Roman* Inſcription (*Fig.* 29.) from *Hadrian*'s Wall by the Kirk of *Kil-patric. Imperatori Cæſari Tito Ælio Hadriano Antonino, Auguſto, Pio, patri patriæ, vexillatio Legionis ſextæ victricis p. foſſam per ter mille* & DCLVI *paſſus.*

Fig. 30.

Fig. 30. An *Iriſh* Inſcription on a ſtately Croſs, carv'd on all Sides. 'Tis at *Munſter Boys*, near *Drogheda*.

The

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[*] *Velſ. Monum. Auguſtæ Vindel.* p. 431. [†] *Grut.* p. 80. [‖] *Id.* p. 433. 1. [‡] *Camb.* p. 827.

The two Cats and the Inſcription we know not what to make of.

Fig. 31. *Fig.* 31. Another at the Abbey of *Cluinmacnos* in the County of *Roſcommon.*

Or Angilla Giarain.
Pray for the ſake of *Giarain.*

Fig. 32. *Fig.* 32. A *Pictiſh* Monument near *Edinburgh*, *In oc tumulo jacit veta F victi.* This the common People call the *Ket-ſtean.* Note, that the *Britiſh* Names beginning with the Letters Gw, began in *Latin* with v, as we find by *Gwytheyrn*, *Gwytheuir* and *Gwythelin*; whom *Latin* Writers call *Vortigernus*, *Vortimarus* and *Vitellinus.* So I ſuppoſe this Perſon's Name was *Gweth* (or *Geth*) of which Name were divers Kings of the *Picts*; whence the vulgar Name of *Ket-ſtone.*

Fig. 33. *Fig.* 33. A Monument of *Kadran* Prince of *North Wales*, about the midſt of the ſixth Century. *Catamanus Rex ſapientiſſimus opinatiſſimus omnium Regum.* This is above the Church-Door of *Lhan Gudwaladr* in *Angleſey*, and is a Confirmation of the Authority of *Geoffrey* of *Monmouth*, who makes Prince *Caduan* the Grandfather of our laſt King *Cadwaladr.*

Fig. 34. *Fig.* 34. A *French* Inſcription at *Bulliſont* Abbey in *Ireland*. *Phelip de la Chapele Ghyt ici, Deu de ſa alma eyit mercipte.*

Fig. 35, 36. *Fig.* 35, 36. Two *Iriſh* Inſcriptions on the Tombs of *Scottiſh* Princes at *Y Columb Kil* in the *Hebrides.* The 35th ſignifies, Pray for *Eogain* (or *Eugenius*); the 26th, Pray for *Ilſata.*

Fig. 37. *Fig.* 37. An Arrow's Head of Flint, commonly call'd *Elf-Arrow* throughout *Ireland* and *Scotland*, where they are fully perſuaded the *Elves* often ſhoot them at Men and Beaſts. This is ſet in Silver, and worn about the Neck as an Amulet, againſt being Elf-ſhot.

The various Reading of an Etruſcan Inſcription *on a* Statue *of* Tages, *&c. by Dr.* G. Hickes. *n.* 302. *p.* 2076.

XVIII. I have carefully examined the Statue, a Deſcription of which was given by *Meſſ. Spanheim* and *Geoffroy*, to be preſented to the Royal Society; together with *Boivin*'s Diſſertation upon it in *French*, in which he endeavours to prove by a great many Arguments, that the Juvenile Image which was lately ſent from *Paris* was that of *Tages.* But whether TAGES amongſt the *Tuſcans* was Author of the Art of Divination, or a Gladiator, or perhaps one who had got a Prize at the Publick Games, or in ſhort whatever he was who is repreſented in that Statue, thoſe *Tuſcan* Characters which are wrote upon the Thigh and the left Leg, which theſe learned Men gave us, or hope they had given us for the *Tuſcan Alphabet*, may ſo far be eaſily deſcribed in two more different Manners by the *Roman* and *Greek* Letters, as far as the Characters remain ſtill whole and entire. The Alphabets we make uſe of in interpreting them are four, *viz.* one of Father *Francis Giambullar*, another of an anonymous Interpreter, a third of *James Gruter*, and a fourth of *Brogiotti.*

The firſt, in which *Francis Giambullar* has expreſſed the Figures and Significations of the *Tuſcan*, is in that excellent little Book of his upon

I. Vol. V. Part II. Page 58.

g.19.

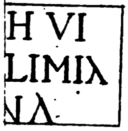
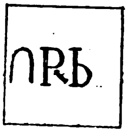


Fig. 20.



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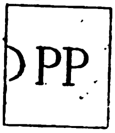

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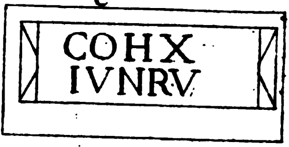

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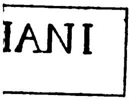

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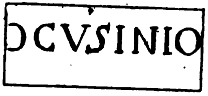

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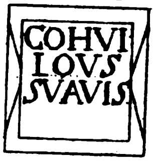

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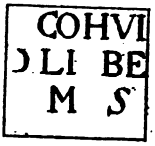


Fig. 29.

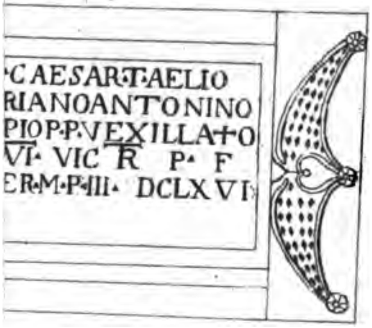


Fig. 30.

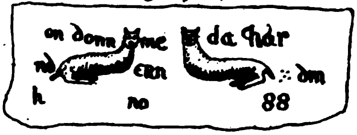
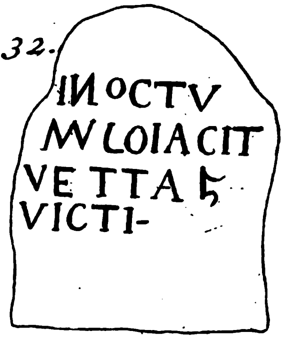


Fig. 32.



1.

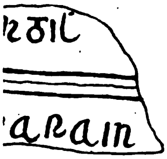
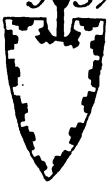


Fig 37.



ig. 36.

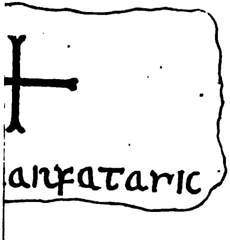
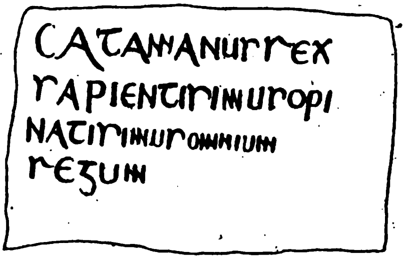


Fig. 33.



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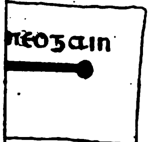
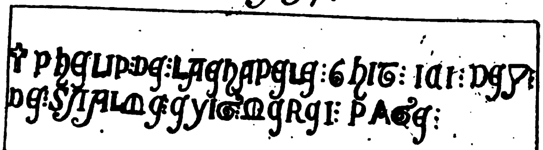


Fig. 34.



the Origin of the *Tuſcan* Language writ in *Italian*, the Title of which is this; *Origine della Lingua* Florentina. *altrimenti* IL GELLO DI M. PIER. FRANCESCO GIAMBULLARI *Academico-Fiorentino.* in FIORENZA. M. D. XLIX. In this ineſtimable Book, page 97. he has given us, he ſays, the *Tuſcan* Characters, printed from right to left, together with their Significations expreſs'd by *Roman* Letters, as delineated in Figure 38. Fig. 38.

In the ſecond, which is to be found amongſt the *Tuſcan* Memorials ſent to the Royal Society by *R. Fabretti* of immortal Memory, the Figures and Significations of the *Tuſcan* Characters are deſcribed by an anonymous Author the ſame way as they are expreſs'd, *Fig.* 39. Fig. 39.

In the third, *James Gruter*, in his Book of ancient Inſcriptions, *pag.* 165. gives a Copy of the *Tuſcan* Characters of the *Eugubine* Records, together with their Significations expreſs'd in *Greek* Letters, as he had conceived them in his Mind; which you may ſee *Fig.* 40. Fig. 40.

But in the fourth, which *Andreas Brogiatti*, the Son, has delineated in his Book, intituled, INDICE DE CATATTERI *con l'Inventori & Nomi di eſſi eſiſtenti* NELLA STAMPA VATICANA & CAMERALE in ROMA. M. DC. XXVIII. the *Tuſcan* Characters of ſeven Braſs Tables, which were found long ago at *Eugubio*, are expreſs'd in quite another manner, and, in my Opinion, a much truer than they are by *Gruter*, with their Significations marked in *Roman* Letters, as in *Fig.* 41. Fig. 41.

According to the firſt of the Alphabets, which are expreſſed in the Tables, calling both Characters of the ſecond likewiſe into our Aſſiſtance, the *Tuſcan* Inſcription on the left Thigh and Leg of the Figure of TAGES, reading it from right to left, runs thus:

MI. GLEDEM: STULPOE: ADI a IMI
GASSI D b GD c II. XD. CECLES: CEVA:

a *perhaps* K.
b *perhaps* A.
c *perhaps* V.

But according to that of *Janus Gruter*, which is the third Alphabet in the Order, the Inſcription muſt be read thus:

μι : αζεδεμ. υλουζαως : αοιπμι :
ασυ . . ι : ο. d ωο . . e . . χο. πυπζευ : πε f α :

d *perhaps* N.
e *perhaps* MI.
f *perhaps* TZ.

By the laſt again, *viz.* that of *Andreas Brogiotti*, the Son, it ſeems to run in this Manner:

MI. GLEDEM: g RULAGE: ADIFIMI
GA: h I: D, . . . GG . . . XD. CECLEN: CETA:

g *perhaps* Z.
h *perhaps* ZZ

Upwards of eighty Years ago *Adrianus Scrieckius* attempted to explain the *Tuſcan* Characters, and not without Succeſs, in a Book which he wrote in *French*, but gave the following *Latin* Title to it: *Adriani*

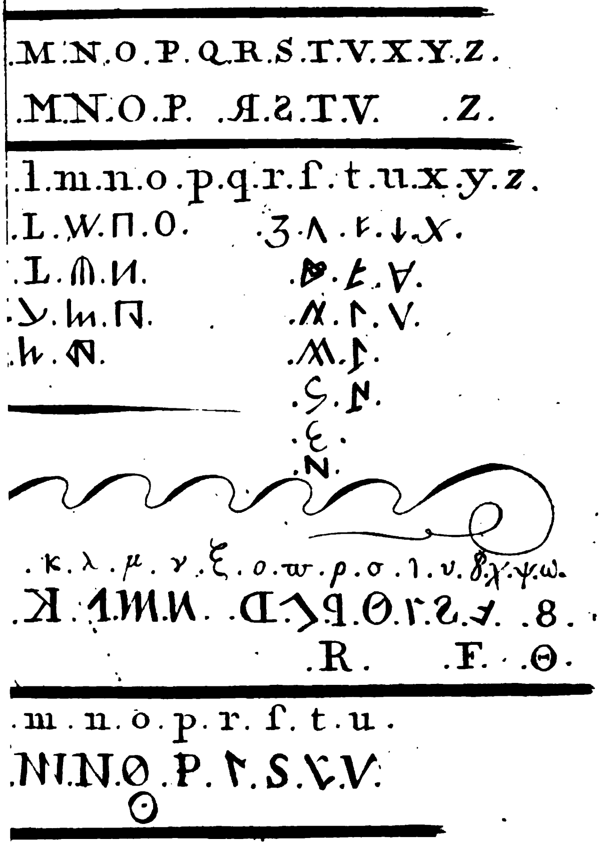
Scrieckii Rodorni Originum rerumque Celticarum, & Belgicarum libri XXIII. In Book 1. pag. 32, 33, *&c.* there is a *Tuſcan* Inſcription, which was given to him when he was a Student at the Univerſity of *Paris*, by *Erricus Memmius*, which he undertook not only to deſcribe, but likewiſe tranſlate ſome Part of it into *Dutch*. But had he tranſlated the whole Inſcription into this Language, as well as he ſeems to have done ſome Part it, then he would have put it beyond all Controverſy, not only whence the *Tuſcan* Language was derived, *viz.* from the *Dutch*, the ancient *Tutonick*, but likewiſe enabled us to explain the Tables at *Eugubium*. It is a Part of theſe which *Gruter* has deſcrib'd and publiſh'd in his Book of ancient Inſcriptions. And theſe Tables, which *Fabretti*, when he was a dying, bequeath'd to the Royal Society, ſeem to be Copies of the ſame, which he had taken Care to have accurately done from the Originals, being a great Inquirer into Antiquities. Beſides one of the Tables, which (it would ſeem) the Royal Society has Copies of, and (excepting ſome Errors of the Ingraver) the moſt beautiful of them all, is the ſame with that which *Adrianus Scrieckius* tried of his own accord to explain, and declared that, God willing, he ſhould interpret the whole of it. But altho' formerly *Scrieckius*, and of late *Fabretti*, much better verſed in ancient Literature than *Scrieckius*, who wanted very much to explain the Tables at *Eugubium* had not the Succeſs which they deſired; yet ſtill it is to be hoped that ſome time or other there will ſpring up a Lover of Antiquity, who will not only be able to explain the ſeveral Tables at *Eugubium*, which have been ſo long a Reproach to the Learned, but likewiſe thoſe of *Volterra*, mentioned by *Giambullari*, pag. 96. and every other Paſſage of the *Tuſcan* Inſcriptions, whether in Statues or Records, that puzzle the Curious. For that there are Statues as well as Tables or Records, with *Tuſcan* Inſcriptions, is not only plain from the Original of your Copy, and ſeveral of the ſame kind, which *Fabretti* took Care to ſend together with his Tables to the Royal Society, but eſpecially from what *Giambullari*, whom I have quoted ſo often above, ſays in his Book, *pag.* 96. as follows: *In the Year* 1507, *the nine and twentieth of* January, *I went to pay a Viſit at a Caſtle in the Neighbourhood, where the Governor's Lady having ordered a Vine to be dug up, there was found a Chamber under Ground twenty Cubits long, five thick, and three broad, with a kind of jetting out in the Sides; where there were found Statues, Aſhes, Ornaments, and* Tuſcan *Characters: Of which I can ſhew you a great many, whenever you have a mind, being allowed the Privilege by our learned and good natured* Peter Vettori, *a diligent Enquirer into Antiquities; together with the* Tuſcan *Alphabet, which at that time was not deſtroyed.*

A Pagan Temple, *and unknown* Characters *at* Cannara *in* Salſet, *by Dr.* A. Stuart. n. 321. p. 372. Fig. 42.

XIX. The rocky Mountain *Cannara* in the Iſland of *Salſet*, belonging to the *Portugueſe*, with the Temple and Caverns; *Fig.* 42.

A. The Temple and Sacrificing-place, like the Choir of a Church, arched and ſupported by 45 Pillars, all cut out of the Rock.

Plate III. Vol. V
Part III Page 60.


.M.N.O.P.Q.R.S.T.V.X.Y.Z.
.M.N.O.P. .R.S.T.V. .Z.
.l.m.n.o.p.q.r.ſ.t.u.x.y.z.
.κ.λ.μ.ν.ξ.ο.π.ρ.σ.τ.υ.φ.χ.ψ.ω.
.R. .F. .Θ.
.m.n.o.p.r.ſ.t.u.
.M.N.O.P.S.V.

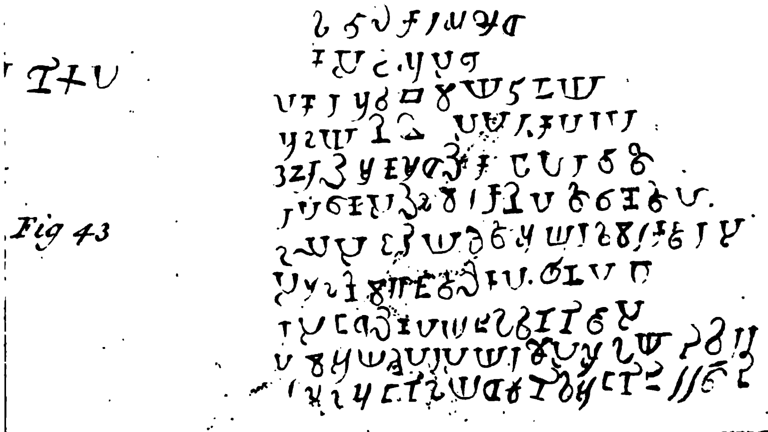


Fig 43

B. The Altar in the furthermoſt End of it alſo cut out of the Rock; with a narrow Canal about the Foot of it, I ſuppoſe deſign'd to be fill'd with Water.

C. C. The unknown Characters engraven on the Rock, on each ſide of the ſquare Entry, repreſented in *Fig.* 43.

D. D. D. &c. The various irregular Paths of Aſcent, ſome cut out in Steps as Stairs.

1, 2, 3, *&c.* The various Caverns, moſtly of a ſquare Figure, ſome large, others ſmaller, cut out of the Rock, whoſe Roofs are cut plain, like a plaiſter'd Room: At the Door of each without is a large Ciſtern or two, cut out of the Rock, full of Rain Water; at leaſt, I could not perceive them to be Springs.

Upon the Sides of the Doors of ſome of the Caverns are Characters like thoſe of the Temple.

Fig. 43. Characters engraven on each Side of the Door or Entry of the *Pagan* Temple of *Cannara*.

Fig. 43.

See Phil. Tranſ. N. 201. † *where ſome of theſe Characters are engraven.*

† *Vid.* ſupra, *V.* III. *P.* ii. C. ii. *S.* xiv.

XX. 1.] About 40 Perches diſtant North from a ruinous Wall, call'd the *Old-Works of Wroxeter*, once *Uriconium*, a famous City in *Shropſhire*, in a Piece of Arable Land, in the Tenure of Mr. *Bennet*, he obſerv'd a ſmall ſquare Parcel thereof to be fruitleſs, and not to be improved by the beſt Manure. Gueſſing the Cauſe of Sterility to be underneath, ſent his Men to dig and ſearch into it; but the Soil being then unſown, caus'd them to miſtake, and ſearch in a wrong Place, where they happen'd upon Bottoms of old Walls, buried in their own Rubbiſh, (being ſuch as are often found in thoſe Fields;) and the Inhabitants digging one of them up, for the Benefit of the Building-Stone, were thereby guided to the Weſtern Corner of the ſaid unprofitable Spot of Land, where they found (near the Foundation) a little Door-place, which, when cleanſed, gave Entrance into the Vacancy of a ſquare Room, walled about, and floor'd under and over, with ſome Aſhes and Earth therein.

A Roman *Sudatory at* Wroxeter *in* Shropſhire, *by Mr.*T. Lyſter. *n.* 306. *p.* 2226.

This was built in Times paſt (as ſome ſuppoſe) for a *Sudatory* or *Sweating-Houſe* for *Roman* Soldiers; being ſet with four Ranks of ſmall Brick Pillars, eight Inches ſquare, and laid in a ſtrong ſort of very fine red Clay, each Pillar being founded upon a Foot ſquare Quarry of Brick; and upon the Head of every Pillar was fix'd a large Quarry of two Foot ſquare, hard almoſt as Flint, as moſt of thoſe *Roman* Bricks are, and within as red as Scarlet, and fine as Chalk. Theſe Pillars were to ſupport a double Floor, made of very ſtrong Mortar, mix'd with coarſe Gravel, and bruiſed and broken Bricks: The firſt of theſe Floors was laid upon the large Quarries, and, when dry, the ſecond Floor was laid upon it.

But firſt there was a Range or Rank of Tunnel Bricks, fix'd with Iron Cramps up to the Wall within, with their lower Ends level with the under Sides of the broad Quarries, and their upper Ends with the Surface of the upper Floor; and every Tunnel had alike two oppoſite

Mortice-holes, one on either ſide, cut through for a croſs Paſſage to diſperſe the Heat amongſt them all.

Fig. 44.

Fig. 44. Is the Ground-plat, on which the Pillars of Brick ſtand.

Fig. 45.

Fig. 45. Is one of the ſaid Bricks; which are in Number 24.

Fig. 46.

Fig. 46. Is the Ceiling of ſquare Tiles, which lie upon the Heads of the ſquare Pillars.

Fig. 47.

Fig. 47. Is the Sweating-houſe in Perſpective, ſhewing in part the manner of the Floors and Pillars as they were placed.

Fig. 48.

Fig. 48. Is the double Floor, whoſe upper Surface lies even with the tops of the Flews in perſpective Draught.

Fig. 49.

Fig. 49. Is one of the Flews, or Tunnel-Bricks.

—*on the ſame, by Dr.* J. Harwood, *ibid.*

2.] *Wroxeter* was one of the moſt conſiderable Military Stations or Colonies the *Romans* had in this Iſland; the City Wall, as appears from a Survey taken by Mr. *Lyſter*, was not much leſs than three Miles in Circumference; it is not improbale but that it was founded by *Suetonius Paulinus*, or after by *Agricola*, in their March to ſubdue *Mona*, now *Angleſey*.

Since I preſented Mr. *Lyſter*'s *Module* to the Society, I have been inform'd by Sir *Chriſt. Wren* that he diſcover'd the Remains of ſuch another *Hypocauſt*, when they were laying the Foundation of the King's Houſe at *Wincheſter*.

Mr. *Hunter* has given an Account of an Antiquity of this kind dug up in *Yorkſhire*, in the *Philoſoph. Tranſact. Anno* 1728 †.

† *Vid.* ſupra, p. 46.

Mr. *Lhwyd*, in his Additions to *Cambden*, takes notice of another diſcovered at *Kaer hyn* in *Carnarvonſhire*; one of the hollow Bricks or Tunnels whereof he there deſcribes, and gives a Figure of it in the Table of the Curioſities, added at the End of the *Welſh* Countries, Numb. 8.

Mr. *Cambden* himſelf mentions an *Hypocauſt* diſcover'd at *Hope* in *Flintſhire*; an Account of which is to be met with in his *Britannia*, page 688, of the *Engliſh* Edition.

Of the Hypocauſta *of the* Ancients, *by Mr.* W. Baxter, *ibid.*

3.] The Ancients had two Sorts of *Hypocauſta*; the one called by *Cicero*, *Vaporarium*, and by others, *Laconicum*, or *Sudatio*, which was a large Sweating-Bath. In which were *Tria vaſaria ahena*, called *Caldarium*, *Tepidarium*, and *Frigidarium*, from the Water contained in them. The other Sort of *Hypocauſtum* is not ſo diſtinctly handled by Antiquaries, and it was a ſort of a *Fornax*, or Kiln, to heat their Winter Parlours, or *Cænatiunculæ Hybernæ*. *Erat & Diæta, ſive Cænatiuncula* (ſaith *Argol* upon *Panvinius*) *ſub qua ignis accendebatur: Unde & Cænatio Hypocauſtum. Cænationes Æſtivæ & Hybernæ*, are mentioned by *Cicero in Epiſtolis*. The Terrace Floor is called by *Vitruvius Teſtudo*. *Teſtudines Alveorum in Communi Hypocauſi calefacientur*, ſaith the ſame Author. This *Hypocauſis* was called *Alveus* and *Fornax*: And the Man that tended the Fire, *Fornacator*. The *Tubuli* ſeem to have been contrived to convey away the Smother, that otherwiſe would choke the *Fornacator*. This kind of Stove ſeems to be graphically deſcribed by *P. Statius* in *Balneo Hetruſci*.

——*Ubi Languidus Ignis inerrat*
Ædibus, & tenuem volvunt Hypocauſta *vaporem.*

Of the Terrace *Argol* has theſe Words, *Teſtitudines ſunt Pavimenta ſub quibus Fornax ardet.*

I take the word *Stove* to be derived from *Æſtus*, quaſi *Æſtuvium*; there wanting hitherto a probable Etymon.

A Moſaic *Work at* Leiceſter, *by Mr.* S. Carte, n. 331. p. 224.

XXI. This Draught is of an *Opus Teſſelatum*, ſtill extant in a Cellar in *Leiceſter*, over-againſt the Elm-Trees, near *All-Saints* Church. It is generally called *Actæon* by ſuch Authors as mention it; but the bare Inſpection of it will convince any one, that 'tis a Repreſentation of the Fable, which ſays, that a Perſon having found Fault with *Venus*, ſhe, to be revenged of him, engaged her Son *Cupid* to make him fall in love with a Monſter.

It was firſt diſcover'd about forty Years ago, upon digging of the Cellar, at about a Yard and a half under the common preſent Surface of the Earth. What Extent the whole Pavement was of, is not known; but this Figure, which was preſerved, is an *Octogon*, ſurrounded by a Liſt, as is in part repreſented in the Corners of the Picture. Without this, though not here repreſented, is a Twiſt or Wreath of various Colours; and round that is a ſecond Liſt like the former. Theſe two Liſts, with the Wreath between them, are 6 Inches and ¼ broad. The downright and tranſverſe Diameters of the *Area* are juſt a Yard; but the others leading from the Corner, are a Yard and two Inches and an half. The Man from Head to Foot, is two Foot and 4¼ Inches. *Cupid* ſeems to be two Foot; but his Feet, as well as the bottom of the Monſter, are ſpoiled, the *Teſſelæ* repreſenting them being gone. The whole *Area* of the *Figure*, which is here left blank, ought to be fill'd up with white *Teſſelæ*, in like manner as ſome Intervals of the Figures are here.

Fig. 50.

Of a Teſſelated *Pavement; and other* Roman Antiquities *near* Eaſt-Bourne *in* Suſſex, *by Dr.* J. Tabor, n. 351. p. 549.

XXII. The Meadow, in which the greateſt part of this teſſelated *Pavement* lies, is near a Mile and a half South-Eaſt of *Bourne*; it contains about four Acres, and is of a triangular Form; the ſouthern Side is againſt the Sea; only a few Fiſhers Cottages, and a ſmall Publick Houſe or two being between that and the Sea. On the northern Side of the Meadow is a High-way, which leads from *Bourne* to *Pevenſey:* The Weſt-ſide is by a Fence of Poſts and Rails ſeparated from a large Corn-Field, in common, belonging to the Pariſh. About the middle of this Fence is the Pavement, diſtant from High-Water-Mark a Furlong; in former Times it might have been ſomewhat more, becauſe from this Point to the Weſtward, the Sea is always gaining from the Land.

In the common Corn Field, Weſt to the Meadow, to the Diſtance of near half a Mile, they often raiſe Bits of Foundations with their Ploughs; and in dry Summers, by the different Growth of the Corn, they can plainly perceive all that Tract of Ground to be full of Foundations.

The Pavement was little more than a Foot below the common Surface of the Ground; what lay next it, was a ſmall Sea Gravel; the Poſition of it is very near due Eaſt and Weſt (about two Foot of the Weſt End of it reaching into the Corn Field;) its Length is ſeventeen Foot and four Inches, its Breadth eleven Foot. At firſt it ſeem'd to have been bounded with a thin Brick ſet on Edge, about an Inch above the *Teſſeræ*, ſo exactly ſtrait and even, as if ſhot with a Plane; and ſo well cemented, as if one entire Brick. But when the Outſide of the Pavement was broke up, we found, that inſtead of Bricks ſet on Edge, as was imagined, it was bounded with a Border of Bricks laid flat, and their Ends next the *Teſſeræ* turn'd up. The Thickneſs of theſe Bricks was an Inch and a quarter; the Breadth not under eleven, and not more than twelve Inches; the Length full fifteen Inches; which before they were turn'd up at the Ends, could not have been leſs than ſeventeen. They were very firm, and not in the leaſt warp'd or caſt in burning: When broke, their Subſtance was fine and well mix'd, of as uniform and clean a red Colour, as a piece of fine *Bole*: Except at the Ends where turn'd up, they were all over cover'd with Plaiſter (the ſame which *Vitruvius* calls the *Nucleus*) half an Inch thick, ſo hard, entire, and even, that it ſeem'd as one Stone, quite round the Pavement.

Next within the Bricks, there was a Liſt or Border of white *Teſſeræ*, thirteen Inches broad; within that, a Liſt of brown *Teſſeræ*, (ſomewhat darker than a Whet-Stone, and ſomewhat lighter colour'd than the Touch-Stone) four Inches broad; then a Liſt of the White, five Inches broad; next within that, another Liſt of the Brown, four Inches broad: All the reſt of the Pavement was ſet with white *Teſſeræ*, without any Ornament or Figure.

A Roman *Bath.* Fig. 51.

When the Ground about the Pavement was dug, on the North-ſide of the Pavement we diſcover'd an entire Bath, ſixteen Foot long, five Foot nine Inches broad, and two Foot nine Inches deep; it was fill'd with Rubbiſh of Buildings, which ſeem'd to have been burnt; *ſc.* hard Mortar adhering to pieces of *Roman* Brick, ſquar'd Stones, and headed Flint, mingled with Aſhes and Coals of Wood. From the Northweſt Corner of the Pavement was the Paſſage into the Bath, three Foot three Inches wide; at which Place, the Bricks that bounded the Pavement were not turn'd up at their End, but lay even with the *Teſſeræ*. At the diſtance of fifteen Inches from the *Teſſeræ* there was a Fall of two Inches, to the Landing place out of the Bath; the Landing-place was alſo three Foot three Inches long, and two Foot two Inches broad: Thence, by two Stairs, was the Deſcent into the Bath; the Length of the Stairs, the ſame as of the Landing-place; the Breadth of each Stair was eleven Inches; the Height of each Step a little more than ten Inches: The loweſt Stair was twenty Inches from the farther Side of the Bath.

Explication of the Figure.

Fig. 51.

A *the Pavement.* B. *the Bath.* C *the Sink, and the other Paſſage through the Wall at the Eaſt-End of the Bath.* D *the* Roman *Brick which bounded the* Pavement *laid flat, and covered with* Terrace. F *Foundations continued ſeveral Ways.* E *the Landing-Place out of the* Bath. G *the Corner of a large Space paved with* Roman *Brick, and covered with Aſhes, Coals,* &c.

The whole Work was very compact, and exactly well made; not in the leaſt injured by Time, nor the Violence it underwent when fill'd up; truly anſwering the Precepts of *Vitruvius (a).*

Although the Author and Time of theſe Works cannot as yet be diſcover'd; yet it is evident the Artificer near enough followed the Directions *Vitruvius* (*b*) gave for framing ſuch like Structures.

As to the Pavement, it was ſecured on every ſide, and the Edges of it reſted on a very firm and neat built Wall, made of *Roman* Brick, ſquared Stone, and headed Flint; between five and ſix Foot deep below the Surface of the Pavement, and full twenty-three Inches thick; which we may ſuppoſe to have been two Foot by the *Roman* Meaſure. The Bricks were not in regular Courſes, as they are to be ſeen

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(*a*) M. *Pollio Vitruv.* de Architectur. Lib. II. Cap. III. Hæc autem ita fieri debent, ut habeatur ratio firmitatis, utilitatis, venuſtatis. Firmitatis erit habita ratio, cum fuerit fundamentorum ad ſolidum depreſſio, & ex quaque materia copiarum ſine avaritia diligens electio.

(*b*) M. *Vitruv. Poll.* Lib. VIII. Cap. I. Primumque incipiam de Ruderatione, quæ principia tenet Expolitionum, uti curioſius ſummaque providentia ſolidationis ratio habeatur. Et ſi plano pede erit ruderandum, quæratur ſolum ſi ſit perpetuo ſolidum. ———Si aut omnis aux ex parte congeſtitius locus fuerit, ſiſtucationibus cum magna cura ſolidetur.———Tunc inſuper ſtatuminetur ne minore ſaxo quam quod poſſit manum implere: ſtatuminibus inductis ruderetur. Rudus ſi novum erit, ad tres partes una calcis miſceatur, ſi redivivum fuerit, quinque ad duum mixtiones habeant reſponſum. Deinde Rudus inducatur, & vectibus ligneis Decuriis inductis crebriter pinſatione ſolidetur; & id non minus *poſt* pinſum abſolutum craſſitudine ſit dodrantis. Inſuper ex Teſta Nucleus inducatur, mixtionem habens ad tres partes unam Calcis; uti ne minore ſit craſſitudine pavimentum digitorum ſenum. Supra Nucleum, ad Regulam & Libellam exacta Pavimenta ſtruantur, ſive Sectilibus, ſeu Teſſeris. Cum ea extructa fuerint, & faſtigia extructiones habuerint, ita fricentur, uti, ſi Sectilia ſint, nulli gradus in ſcutulis, aut trigonis, aut quadratis, ſeu favis extent. Sed coagmentorum compoſitio planam habeat inter ſe directionem. Si Teſſeris ſtructum erit, ut eæ omnes angulos habeant æquales, nullibique à fricatura extantes. Cum enim anguli non fuerint omnes æqualiter plani, non erit exacta ut oportet fricatura.

in thoſe *Roman* Buildings, which are in View above Ground; but without Order diſpers'd about in the Wall. The top of the Wall indeed was but fifteen Inches thick; and that was cover'd with the Bricks firſt mentioned, which bounded the Pavement: But about fourteen Inches below the Top, there was a Set-off in the Inſide of the Wall, eight Inches broad. We did not dig up the Foundation of the Pavement to the bottom, but opened it at one Corner only, that we might diſcover how it was fram'd; for when it was bor'd through, they obſerv'd, next under the *Teſſeræ*, a Bed of very ſtrong Mortar, more than a Foot thick; under the Mortar, a Bed of Clay, two Foot thick; and under the Clay, a firm Foundation of Brick. We obſerv'd the Clay (which the Ground thereabouts does not afford) to be very fine and red, and alſo cloſe; no doubt but carefully ramm'd. The Surface of the Clay was neatly pitch'd with ſmall Flint and Stones; pointed at their lower Ends, and headed at their upper Ends. This Pitching or Paving is by *Vitruvius* call'd *Statuminatio*; and the Stones 'tis done with he calls *Statumina*. He directs them to be ſet, when the Underwork is made ſound and firm, by well ramming.

This pitch'd Work was exactly even with the Set-off in the inſide of the Wall; on it was laid a Bed of coarſe Mortar, of about nine Inches thick; the Skirts of this Mortar, (which by *Vitruvius* is call'd the *Rudus)* reſted on the Set-off above-mention'd; it was compos'd of Lime, a ſharp coarſe Sand, ſmall Pebbles, and bits of Brick. Upon this *Rudus* was a finer Compoſition, made, as near as I could gueſs, with Lime, a fine ſharp Sand, ſome kind of Aſhes, and (which was the greater Part) ſtampt Brick and Pot-ſherds, in Grains not larger than Cabbage-Seed, and the Flower or fine Powder ſeparated from it. This Bed was about half a Foot thick, and is what *Vitruvius* calls the *Nucleus*. Whether we may call it *Terrace*, I leave to others. Both this *Nucleus*, and the *Rudus* under it, very near equall'd the *Portland* Stone in Hardneſs and Compactneſs. Upon this *Nucleus* or *Terrace* were the *Teſſeræ* ſet: They were ſet an end; but ſo exact was the Workman in ſetting them, that he uſed two Sorts of Cement to fix them withal; their lower Ends ſtood in a Cement of Lime only, well work'd; their upper Halves were cemented with a fine grey Mortar, conſiſting of fine Sand, and (as it ſeem'd) Aſhes and Lime. This grey Cement every where fill'd the Intervals at their Heads, and was much harder than the *Teſſeræ* themſelves.

The *Teſſeræ* were but of two Colours, white, and of a dark brown; they were harder than a glaz'd and well burnt Tobacco-Pipe, and of a Grit ſomewhat finer; the Brown ſeem'd to be of the ſame Subſtance with the white, but colour'd by Art, (as *Pliny* informs us (*c*) the Workers in Clay, of old, had a Method to do): They ſeem'd

to

(*c*) Plin. Secun. Hiſt. Mund. Lib. XXXVII. Cap. XII.

to have been form'd in a Mould, and afterwards burnt. Hence I am inclin'd to take the Meaning of *Vitruvius*, where he makes ſo plain a Diſtinction between the *Teſſeræ* and the *Sectilia*; that the one was, according to the Import of the Name, form'd by Inſtruments out of Stone, Brick and Tile; the other ſhaped in a Mould and burnt. They were not of an equal Size, none exceeding an Inch in Length; the ſhorteſt were $\frac{6}{10}$ of an Inch; moſt of them were equally made their whole Length; but of ſome the lower Ends terminated almoſt as ſharp as a Wedge, on purpoſe, as may be ſuppos'd, to be driven where any Interſtices were left: At their Heads likewiſe, they were not all equal and alike, ſome exactly Square, ſome oblong Square, ſome Semi-lunar, but none Triangular: The Diameter of thoſe that were ſquare was about $\frac{4}{10}$ of an Inch; the longeſt Side of thoſe that were oblong at the Head little exceeding half an Inch. It may be obſerved, that the Preparations for fixing this Pavement here, go beyond thoſe which *Vitruvius* preſcribes (in the firm Wall near ſix Foot below the Surface, in the Bed of Clay within it two Foot thick, and in the Foundation of Brick under the Clay.) But when we conſider the Situation of the Ground here is low, not many Feet higher than the Sea might be elevated at Spring-Tides; and that it might as well be annoy'd by Land-Springs after great Rains, as by Water owzing through the Earth from the Sea ſo near, from which the Work in time might receive Damage; we muſt allow the above-mentioned Additions to be the Reſult of a very judicious Fore-ſight.

A Roman *Bath.*

The Bath alſo was form'd and ſecur'd by a very compact Wall of the ſame Breadth and Depth with that on which the Pavement reſted: The Wall, which ſuſtain'd the North-ſide of the Pavement, made the South-ſide of the Bath. On the South-ſide of the Bath, from the Eaſt end to the Ends of the Stairs, there was a ſolid Seat, twelve Foot nine Inches long, very near ten Inches broad, and fourteen Inches high. The Bottom or Floor of the Bath was made after the ſame manner as the Pavement was made, excepting the *Teſſeræ*, and the thick Bed of Clay; for under all there was Brick, then a Bed of the *Rudus* or coarſe Mortar ſomewhat more than a Foot thick; above that the *Nucleus* or Terrace only half a Foot thick. The Sides of the Bath, the Seat and Stairs, were plaiſter'd over with this Terrace about half an Inch thick; all which were throughout ſo hard, compact and ſmooth, that, when firſt open'd, the whole ſeem'd as if it had been hew'd out of one entire Rock, and poliſh'd. At the middle of the Eaſt end, at the Bottom, there was a Sink-hole, a little more than three Inches long, and above two Inches deep; about four Inches above it there was another Paſſage through the Wall of the ſame Size; the firſt we may ſupoſe to let out the Water which had been uſed, the other to let in freſh. The Stairs and Seat were chiefly made of *Roman* Brick, between fifteen and ſeventeen Inches long, between eleven and twelve broad, and near one and a half thick.

At the North-ſide of the Bath the Ground was not open'd; but at the Eaſt-end of the Bath and Pavement, at the South-ſide of the Pavement, and at the Weſt-end of both, there ſeem'd to have been ſeveral Vaults or Cellars: for there were very firm 23 Inch Walls continued every way (to the farther Ends of which we did not trace,) whoſe Foundations were as low as that which ſupported the Pavement; ſo that to the Depth of ſix Foot the Ground was fill'd with ſuch Rubbiſh as was taken out of the Bath. The Bricks in this Rubbiſh, which were all broke, had ſeveral Degrees of Thickneſs from three Inches to a little more than one Inch; ſome had one of their Fig. 52, 53. Sides wav'd, as in *Fig.* 52. ſome Fret-wiſe, as in *Fig.* 53. others had Roſes on them well imitated; we found alſo two Sorts of channel'd Bricks; the one like a Trough, the Channel three Inches broad, and as many deep, the Brick itſelf an Inch and a half thick; the other Sort had a Cylindrical Channel; ſo that when two were clapt together, they form'd a hollow Cylinder of three Inches diameter. Theſe channel'd Bricks being all broken, their Length when whole, is uncertain, as is the Uſe they ſerv'd to; whether for Paſſages to convey Water, or whether they were placed in the Walls to diſtribute Heat throughout the Building, as was uſual in the ancient Structures at *Rome*.

Fig. 51. 'Tis farther obſervable, when the Ground was open'd a ſecond time, that off from the South-Weſt Corner of the Pavement, which the Letter G ſhews, five Foot lower than the Surface of the Pavement, there was diſcovered a large Space (to the end of which we did not ſearch,) paved with Brick, eleven Inches broad, almoſt one and a half thick, and fifteen long; it was ſubſtantially paved, for it had two Courſes of this Brick. There was half a Foot of Mortar under the lower Courſe, and about an Inch of Mortar between the two Courſes; theſe Bricks alſo were perfectly well made; but on the other ſide of each were two Knobs, about the Size of half a Walnut, fix'd on them, as may be gueſs'd, to keep them ſteady, till the Mortar they were ſet in might dry. This paved Place was ſearched ſix or eight Foot every way; it was all covered with a Coat, about two Inches thick, of Aſhes and large Coals of Wood; on that lay confuſedly large Pieces of the *Rudus* or Coarſe Mortar above-mentioned, and Lumps of the *Teſſeræ* in all reſpects like thoſe on the Pavement, and cemented as they were. There were moreover mingled with the Aſhes many large Iron Nails, bigger, but not quite ſo long, as thoſe we call double Tens; ſome Hooks for Doors to ſwing on: Several ſmall Pieces of Earthen Ware; ſome like Bits of Urns; ſome of a fine yellow Clay; ſome red, thin, neatly wrought and adorned with Flowers; and laſtly, part of a human Skull, and pieces of Bones near it; which Bones were not inclos'd in any Veſſel, but lay looſe: They were diſcoloured, like thoſe I have ſeen in Urns; ſo that the Body they belong'd to, might periſh by the ſame Flames that theſe Buildings were deſtroyed by. There was no Inſcription found either on Stone or Brick; no Statue or other Figure, ſave thoſe on the Bricks mentioned; neither were there any Coins met with there. But ſomething more than a Furlong North-Weſt of theſe Works, near three Years ſince, there was a Malt-houſe, and near two Years ſince a Dwelling-houſe erected; in digging the Foundations for the firſt there was a Coin of *Poſthumus*; and in the Ground dug for the laſt, a Piece of *Conſtantine*'s found.

From the Nearneſs of the Bath, it may reaſonably be concluded that the Pavement was neither a Part of a Temple, nor for a Place of Juſtice: The Continuation of the Foundations every way to be traced from it, and what was laſt diſcovered, are rather an Argument it was an Apartment of a magnificent Palace.

Lithoſtrota. *Pliny* ſuppoſed that theſe *Lithoſtrota* (*d*) or teſſerated Pavements had their Original in *Greece*; but perhaps the *Grecians* borrow'd their Patterns from *Aſia*: For from the Book of *Eſther* (*e*) we learn there was a moſt Royal Banquet at *Suza*, on a *Lithoſtroton* (ſo the Septuagint has it) of coſtly Stones, four hundred Years before the Time of *Sylla*, who brought them firſt into *Italy*. *Joſephus* affirms (*f*,) that the *Grecian* Laws, Learning and Arts were fetch'd from *Aſia*; and indeed when we reflect on the Antiquity of the *Levitick* Law; the Pyramids of *Egypt*; the Temple of *Solomon*; the Walls and Palaces of *Babylon*; and the ſumptuous Remains of *Palmyra* and *Perſepolis*; we have no reaſon to eſteem the *Grecians* Authors, but as good Imitators of thoſe early Examples of Learning and Arts they had to follow.

When *Quinctus Cicero* was here with *Cæſar*, the ſecond time he invaded *Britain*, his Brother *Tully* had the Overſight of ſome Buildings he had appointed to be made in the *Villa Manliana* at *Arcano*; and in a Letter ſent into *Britain*, *Tully* informs *Quinctus*, that he was well pleas'd with the Seat, and the more, becauſe the *Pavimented Piazza* was magnificent; that the Pavement ſeem'd (*g*) to be exactly well made; that he had directed ſome Chambers to be alter'd, becauſe he did not approve of them; that in the Bathing Apartment he had removed the Sweating-Room into another Corner of the *Apodyterium*. And afterwards in the ſame Letter makes mention of ſuch another Work which was in hand for him in the City alſo. Again, about the time *Quinctus* returned out of *Britain*, and was fix'd, with the Legion he preſided over, in Winter Quarters, among the *Nervii* (of which *Cæſar* in his Commentaries makes mention,) *Tully* (*h*) takes notice

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(*d*) Plin. Sec. Hiſt. Lib. XXXVI. Cap. XXV.

(*e*) Eſth. Chap. I. v. 6.

(*f*) Joſeph. *againſt* Appion. Book II.

(*g*) Tull. Cic. ad Quinct. Frat. Lib. III. Ep. I.

(*h*) *Ibid.* Ep. III.

tice of a Pavement that was making for himſelf alſo: *Expolitiones utriuſque noſtrum, ſunt in manibus; ſed tua pæne ad tectum jam perducta res eſt ruſtica Arcani & Laterii.* It is hinted by *Varro* that a *Lithoſtroton* was one of the Members of a complete *Villa* (*i*): *Varro* was eighty Years old when his Books *de re ruſtica* were compos'd: *Tully* was ſomething more than fifty when the above-cited Epiſtles were wrote; *Cæſar*, when a General, made the *Teſſeræ* (*k*) and *Sectilia* for Pavements to be part of his Baggage; and *Vitruvius*, Cotemporary with theſe three, calls the *Lithoſtrota*, *Principia Expolitionum* (*l*); which make it evident theſe Floors were held in Eſteem. We may obſerve too, that ſome time before, and in the firſt Age of the Empire, the Humour of theſe Kinds of Floorings much prevail'd among the *Romans*; wherefore it is no wonder they are found in ſo many Places of this Iſland. But in the Time of *Pliny* they began to be out of uſe on the Ground; but then he tells us, they were made above Stairs (*m*) or, in his own Words, in Chambers. Whether the *Lithoſtrota* in Chambers were uſual in *Vitruvius*'s Days, we have no Warrant to ſuppoſe from any Hint in his Writings; notwithſtanding he gives Rules for making them, *plano pede*, on the Ground; and *ſub* (*n*) *dio*, (which from the Method by him preſcrib'd muſt be) aloft; becauſe, for ſuſtaining thoſe *ſub dio*, he orders the Work underneath to be well ſecured with two Lays of Plank, that ſhould croſs (*o*) each other, and be nail'd down; then the *Statuminatio* or Pitching, the Mortar, Terrace and *Teſſeræ*, as before on the Ground. But becauſe by *ſub dio Vitruvius* could not deſign Chambers; and altho' *Pliny* informs us the *Grecians* uſed (*p*) to cover or flat-roof their Houſes with theſe Pavements, yet ſince neither *Vitruvius* nor *Pliny* mention any ſuch Mode prevailing in their Times at *Rome*, it remains, that we may imagine *ſub dio*, or the *Subdialia* of *Vitruvius*, to mean Pavements mounted on Pillars or Arches, which might afford delightful Terraces out of the upper Rooms, and ſhady Piazzas underneath; and in this Senſe perhaps may be underſtood the *Porticus Pavimentata* of *Tully*. By the many Apartments the Foundations about theſe Works point out, there ſeems to have been nothing wherein the Buildings that once ſtood there might come ſhort of the magnificent Structures, wherewith the *Romans* delighted to gratify

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(*i*) Ter. Varro de ruſtic. Lib. III.

(*k*) Suet. Tranq. Jul. Cæſ. Cap. 46.

(*l*) M. *Vitruv. Pol.* Lib. VII. Cap. I. (*m*) Plin. Hiſt. Lib. XXXVI. Cap. XXV. Pulſa deinde ex humo Pavimenta in cameras tranſiere è vitro: novitium & hoc inventum.

(*n*) M. *Vitruv.* Lib. VII. Cap. I. Sub dio vero maxime idonea faciunda ſunt pavimenta.

(*o*) *Ibid.* Itaque ſi neceſſitas coegerit, ut minime vitioſa fiant ſic erit faciundum: cum coxatum fuerit, ſuper altera coaxatio tranſverſa ſternatur, claviſque fixa, *&c.* ——Statuminatione facta rudus inducatur, *&c.*

(*p*) Plin. Hiſt. Lib. XXXV. Cap. XXV. Subdialia Græci invenere talibus domus contegentes.

gratify their Luxury. The Uſes each were deſign'd for, is not to be determin'd: Whether there was a Piazza cover'd with a *Lithoſtroton*, cannot be affirm'd. But be that as it will, 'tis next to Demonſtration, there was ſome upper Floor ſuſtain'd by Wood, and pav'd with the *Teſſeræ*, after the ſame manner as *Vitruvius* directs; and, on the Brick Pavement (laſt diſcover'd,) the Coat of Aſhes and Wood-Coals with Nails, cover'd with large Pieces of the *Rudus*, and great Lumps of the *Teſſeræ* well cemented together, and the *Nucleus* adhering to them, ſhew there was an upper Pavement broke by its Fall, when Fire had conſum'd its Support.

As to the *Roman* Architecture, it is to be obſerved that when they deſign'd a Building, they could not immediately begin it; their Preparations required Time; by their well-ſhap'd durable Bricks, and by their Stone-like Mortar, we may plainly perceive they built not with ſuch haſty Materials as are now uſed. *Vitruvius* and *Pliny* both direct, that Brick ſhould be form'd in the Spring, and be two Years drying. And where *Pliny* ſpeaks of their Mortar, he ſays, it was ordain'd by the old Laws of *Rome*, that no Undertaker ſhould build a Houſe with Mortar which had not been made three Years before. We find indeed, their Walls ſeem to bid fair for Eternity; whereas ours, for Parſimony and ill Management, are ſcarce able to endure one Age.

Where *Tacitus* ſpeaks of *Britain* and its Affairs, his Deſcriptions are n. 356.
ſo lively deliver'd, that one would think himſelf had been here, with p. 783.
his Wife's Father *Agricola*; and where he mentions the *Iriſh* (*q*) Prince, the Expreſſion by him uſed ſeems to give Strength to ſuch a Suppoſition.

The gaining the ſouthern Part of this Iſland, was the greateſt, if not the only Acquiſition, made to the *Roman* Empire, from the Death of *Tiberius* to the ſixth Year of *Claudius*; which we may well ſuppoſe was not paſs'd over in Silence by *Tacitus*: But his four Books of Annals, which contain'd the Tranſactions of thoſe nine Years, are loſt. From the Mention *Suetonius* makes of *Claudius*'s Expedition hither, it is commonly inſinuated his Conqueſt here (*r*) coſt no Blood. Our Countryman *Bede*, we may ſee was of that Opinion; becauſe, in the Account given by him of *Claudius*, the Words of *Suetonius* (*s*) are copied. But *Dio Caſſius*, from whom we have the moſt particular Information of that War, gives a quite different Relation of the Matter: He takes notice of at leaſt four Battles fought with the *Britons* (before *Claudius*' came over) by *Aulus Plautius*; who had *Flavius Veſpaſianus*,

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(*q*) Tac. Agric. Cap. XXIV.

(*r*) Suet. Claud. cap. xvii. *Ac ſine ullo prælio aut ſanguine, intra pauciſſimos dies parte inſulæ in deditionem recepta, ſexto quam profectus erat menſe Romam Rediit.*

(*s*) Bedæ Eccleſ. Hiſt. Gent. Angl. lib. i. cap. iii.

paſianus, *Flavius Sabinus*, and *Hoſidius Geta*, that commanded under him: In the firſt Conflict, *Cataractacus* was defeated; in the ſecond, *Togodumnus*, and as may be inferred from his Words, afterwards ſlain. From the Manner of his delivering the Story, all thoſe Battles ſeem to have been fought, South of the River *Thames*, and North of the *Sylva Anderida*, except the laſt; and that in the firſt Campaign the Conqueſts of *Plautius* could not have extended beyond *Kent* and *Surry*: For it is likely (*t*) that the two firſt Actions happen'd about the Skirts of the *Sylva Anderida*, eaſtward of the River *Medway*; and the third, which held two Days, on the Banks of that River; becauſe, from the River, where they were routed two Days ſucceſſively, the *Britons* retiring, aſſembled (*u*) their Strength again, before their fourth Overthrow in that part of *Kent* which borders on the *Thames*, not far from its Entrance into the Sea; and having paſs'd it, were follow'd by *Plautius*'s *Germans*, and on the other ſide put to Flight; which was the fourth Action mention'd by *Dio*. *Claudius* having been ſent for, comes the ſecond Year with powerful Succours to the Aſſiſtance of *Plautius*; who with his Forces waited his Arrival near the *Thames*, not unlikely ſtill where he quarter'd in the Winter, which perhaps was in that large ſtrong Camp, as yet to be ſeen (*w*) not far from *Bromley* in *Kent*, on the River *Ravenſbourn*. The Emperor joining him (*x*), immediately croſs'd the *Thames*, overthrew the *Britons* poſted on the other ſide to reſiſt him, advanced to *Cynobelin*'s chief Reſidence *Camalodunum*, and took it: Then receiving Homage of ſome States return'd to *Rome*.

Conſidering therefore that *Claudius* ſtaid but ſixteen Days (*y*) in this Iſland, we muſt conclude his Diſpatch was great; and that his Progreſs could not have been through more Parts than *Kent*, *Eſſex*, *Hertfordſhire*, *Middleſex* and *Surry*. As to what elſe relates to the *Britiſh* War in the Time of *Claudius*, ſave that three Years after *Titus* reſcued

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(*t*) Dion. Caſſii Hiſt. Rom. Lib. LX. Claud. V. p. 768. A. Οἱ γὰρ Βρεττανοὶ μὴ προσδοκήσαντες αὐτοὺς δι' ἅπερ ἐπυνθάνοντο ἥξειν, οὐ προσυνελέγησαν, οὐ μὴν οὐδὲ τότε ἐς χεῖρας αὐτοῖς ἦλθον ἀλλ' ἔς τε τὰ ἕλη καὶ ἐς τὰς ὕλας κατέφυγον, ἐλπίσαντες σφᾶς ἄλλως κατατρίψειν, ὥσθ' ὅπερ ἐπὶ τοῦ Καίσαρος τοῦ Ἰουλίου ἐγεγόνει, διακενῆς αὐτοὺς ἀναπλεῦσαι. Ὁ οὖν Πλαύτιος πολλὰ μὲν πράγματα ἀναζητῶν σφᾶς, ἔσχεν, ἐπεὶ δὲ εὗρέ ποτε, πρῶτον μὲν καταράτακον ἔπειτα Τογόδουμνον Κυνοβελλίνου παῖδας ἐνίκησεν.——— φυγόντων δὲ ἐκείνων ———— πρόσω ᾔει, ὡς δ' ἐπὶ ποταμῷ τινὶ ἐγένοντο.

(*u*) Pag. 678. D. Ἀναχωρησάντων δ' ἐντεῦθεν τῶν Βρεττανῶν ἐπὶ τὸν Ταμέσαν ποταμὸν, καθ' ὃ ἔς τε τὸν ὠκεανὸν ἐκβάλλει, πλημμύροντός τε αὐτοῦ λιμνάζει.

(*w*) Cambden Brit. Edit. 1695. Col. 213. c.

(*x*) Dion. Caſſii Hiſt. Rom. Lib. LX. pag. 679. B. Κἀντεῦθεν τὰ μὲν πεζῇ, τὰ δὲ καὶ διὰ τοῦ ποταμοῦ πορευόμενος, πρός τε τὸν Ὠκεανὸν ἀφίκετο, καὶ περαιωθεὶς ες τὴν Βρεττανίαν, συνέμιξε τοῖς στρατοπέδοις πρὸς τῷ Ταμέσα αναμένουσιν αὐτὸν, καὶ παραλαβὼν σφᾶς, ἐκεῖνόν τε διέβη, καὶ τοῖς βαρβάροις πρὸς τὴν ἔφοδον αὐτοῦ συνεστραμμένοις ἐς χεῖρας ἐλθὼν, μάχῃ τε ἐνίκησε.

(*y*) Dion. Lib. IX. pag. 680. B. Ηλθέ τε ἐς τὴν Ῥώμην ὁ Κλαύδιος, ἓξ μῆνας ἀποδημήσας (ἀφ' ὧν ἑκκαίδεκα μόνας ἐν τῇ Βρεττανίᾳ ἡμέρας ἐποίει.

reſcued his Father *Veſpaſian* when in great Danger, we have no Account from *Dio*. But where *Suetonius* (*z*) treats of *Veſpaſian*'s Life, we are told, when that Emperor commanded in *Britain* for *Claudius*, that he fought thirty Battels, ſubdued two of the moſt powerful Nations, won twenty Towns, and brought the Iſle of *Wight* under the *Roman* Obedience. Of which Actions, beſides what might have been ſaid in the laſt Books of Annals, *Tacitus*, in other Pieces of his, largely (*a*) hints, that when *Claudius* ruled, *Veſpaſian*'s Behaviour and Succeſs in this Iſland ſhew'd to the World his Conduct and Courage in the Affairs of War: The ſame is alſo taken Notice of (*b*) by *Dio*. From his Conqueſt of the Iſle of *Wight*, it may be implied, the Stage of his Actions here was in thoſe Countries which border on the South Channel rather than in the North: Since therefore the Clime, the Soil, and the more ready Conveniencies for foreign Trade and Correſpondence might intitle this Part of the Land to ſuſtain as numerous, as ſtout, and as experienc'd a People as any other (becauſe *Cæſar* (*c*) takes notice they not only lent Aids to the *Veneti* in their Revolt, but were wont to aſſiſt the *Gauls* in moſt of their Wars againſt (*d*) the *Romans*:) And whereas no Hiſtorian afterwards mentions any Diſturbance given to the *Romans* from the ſouthern Parts, we may conclude, *Veſpaſian* entirely ſubdued them.

The *Romans* as ſoon as the Countries they had conquer'd were reduced to ſome degree of Quiet, endeavoured to make the People in love with their Government, by introducing their Arts and Cuſtoms among them: From that inconſiderable Inſtance recorded (*e*) by *Pliny*, we may ſee how ready the *Romans* were to oblige the People under their Power with any Curioſity that might entertain their Senſes, in order to endear them to the Authority they had over them. (He tells us, Cherries were not known in *Italy*, till the 680th Year of *Rome*, when *L. Lucullus* firſt brought them thither from *Pontus*; and that in a hundred and twenty Years they were ſo increas'd, that not only many other Countries, but *Britain* alſo was ſupplied with them, which muſt have been about three Years after *Claudius* himſelf had been here. The uſual Landing from *Rome* being then in the

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(*z*) Suet. Veſpaſian. cap. 4.

(*a*) Tacit. Agricol. cap. xiii. *Divus Claudius auctor operis tranſvectis legionibus auxilliiſque, & aſſumpto in partem rerum Veſpaſiano; quod initium venturæ mox fortunæ fuit, domitæ gentes, capti Reges, & monſtratus fatis Veſpaſianus.* Tacit. Hiſt. Lib. III. cap. xliv. *Et Britanniam inclytus erga Veſpaſianum favor, quod illic ſecundæ Legioni à Claudio præpoſitus, & bello clarus egerat, non ſine motu adjunxit cæterarum.*

(*b*) Dion. Caſſ. Hiſt. Rom. Lib. lxv. p. 736. ἥτε γὰρ τῶν ἀνθρώπων εὔνοια πολλὴ ἦν πρὸς αὐτὸν———ἥ τε γὰρ ἐκ τῆς Βρεττανίας δόξα, καὶ ἡ ἐκ τοῦ ἐν χερσὶ πολέμου εὔκλεια.

(*c*) De Bello Gal. lib. xiii. *Socios ſibi ad id Bellum Oſiſmios, Lexobios,* &c. *auxilia ex Britannia, quæ contra eas Regiones poſita eſt, accerſunt.*

(*d*) Idem lib. iv. *Tamen in Britenniam proficiſci contendit, quod, omnibus ferè Gallicis Bellis, hoſtibus noſtris inde ſubminiſtrata auxilia intelligebat.*

(*e*) Plin. lib. xv. cap. xxv.

County of *Kent*, that Fruit without queſtion was there firſt planted, and the Soil well agreeing with it, may be the Reaſon that the beſt and greateſt Quantity of it is yet there to be had.

Agricola, in the ſecond Year of his Lieutenancy here, when in Winter-Quarters, purſued the ſame Maxims (which *Tacitus* terms *Saluberrima Conſilia*; and, as it may be inferr'd from an Expreſſion of (*f*) *Cæſar*, conducive to the ſame End) to gain the *Britons*, by making them acquainted with the *Roman* Manners: He not only in private perſuaded, but publickly helped and encouraged them to build Temples, Places for common Aſſemblies, and private Houſes after the *Roman* Mode: He took Care to have the principal Youth inſtructed in the liberal Arts: He allur'd them to affect the Habit of the *Romans*: And laſt of all, to engage them the more firmly, helped them to a Taſte of the *Roman* Luxury and Good-fellowſhip, by introducing the Uſe of ſhady Piazzas and Baths (*g*), and their way of banquetting. But here *Tacitus* may be underſtood to ſpeak of what was done in order to civilize the Northern Parts of this Nation, where *Agricola*'s Preſence was required; the Southern was, we may ſuppoſe, ſoftned and quieted by the ſame Methods near forty Years before, when reduced by *Veſpatian*.

From hence it may be inferr'd, that ſhould never any other Tokens of the Antiquity of theſe Works be found, yet would the Bath denote the Age of the Pavement, and ſet it near as high as the moſt early Time that the *Romans* had any real Authority in this Iſland.

As, by the Loſs of ſome of the Annals of *Tacitus*, we may have been depriv'd of the moſt early Hiſtory of this County; ſo likewiſe, for want of ancient religious Houſes, there have been little or no Accounts left of its Circumſtances in the Times next after the *Roman* Authority expired here. *Malmſbury* (*h*) ſays, that in his Time there were here only the Abbies of *Battell* and *Lewes*, and thoſe not long erected. The earlieſt Mention made of it (*i*) is by *Bede*, who informs us that Biſhop *Wilfrid*, in the Year 678, being thruſt out of his Province of *Northumbria* by King *Ecgfrid*, ſettled at *Selſey* in 680, and ſtaid five Years, labouring in the Converſion of the neighbouring Parts; but of what elſe relates to the County, except the miſerable Ignorance of the Inhabitants, and the Number of Families, he has left no Account. *Bede* ſpent moſt of his Time in the Monaſteries of *Wiremouth* and *Jarrow*, and travell'd little.

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(*f*) De Bell. Gallic. lib. i. *Horũm omnium fortiſſimi ſunt Belgæ: Propterea quod cultu atque humanitate Provinciæ longiſſimè abſunt, minimeque ad eos Mercatores ſæpe commeant, atque ea quæ ad effeminandos animos pertinent, important.*

(*g*) Tacit. Agricol. cap. xxi.

(*h*) Gul. Malmsb. de geſtis Pontific. Ang. lib. ii.

(*i*) Bedæ Hiſt. Eccleſ. lib. iv. cap. xiii.

Of the Sylva Anderida.

The next Records we have to view are thoſe of *Ethelwerd*, the *Chronicon Saxonicum*, and *Henry* Archdeacon of *Huntingdon*. But the ancient State of this County may be clearly apprehended by looking into the Map of it, and at the Weſt-end you will find *Weſt-Harting* and *Stanſted* diſtant from each other ſix or ſeven Miles: Imagine a ſtreight Line to be drawn from *Harting* to *Bourne* near *Pevenſey*, and another to be drawn from a Point which muſt be little South of *Stanſtead* to *Brighthelmſtone:* What lies North of theſe Lines is the Weald or Low-Lands, formerly the *Sylva Anderida*; that which is comprehended between theſe Lines and bounded by the Sea, from *Brighthelmſtone* to *Bourne*, is the *Downs*, ſo famous for their pleaſant Situation and Fruitfulneſs. The Part South of theſe Lines is a flat champain Ground, ending like a Wedge at *Brighthelmſtone.* Theſe two laſt Parts were thoſe only that were inhabited in *Bede*'s Time; they contain not more than two Fifths of the whole County, which muſt be the Reaſon why *Bede* ſaid, *Suſſex* (*k*) conſiſted not of more than 7000 Families or Farms; whereas in another Place he computes *Kent* to have 15000 Families.

In the three Accounts (*l*) above-mention'd, it is agreed, that in the Year 477, *Ella*, with his three Sons, *Cymen*, *Wlencing* and *Ciſſa*, landed his Forces at *Cymenes-Ora*, (which, from a Charter of King *Cedwallas* to the Church of *Selſey*, the learned (*m*) *Cambden* proves to be about *Wittering* near *Selſey*;) not far from which he routed the *Britons*, and drove them into the Weald (**Andredeſleige**). Their farther Progreſs is moſt diſtinctly and naturally deliver'd by the Archdeacon of *Huntingdon*, in theſe Words: *Saxones autem occuparunt littora Maris in* **Sudſexe**, *magis magiſque ſibi regionis ſpatia capeſſentes, uſque ad nonum annum adventus eorum. Tunc verò cum audaciùs regionem in longinquum capeſſerent, convenerunt Reges & Tyranni Brittonum apud* **Mercredesburne**, *& pugnaverunt contra* Elle *& filios ſuos, & fere dubia fuit victoria. Uterque enim Exercitus valdè læſus & minoratus, alterius congreſſum devovens, ad propria remearunt. Miſit igitur* Elle *ad compatriotas ſuos auxilium flagitans.*

This County having been invaded in the moſt Weſtern Part of it by the *Saxons*, if what they did afterwards was to poſſeſs themſelves of it, their Progreſs muſt have been from Weſt to Eaſt. And ſo much *Henry Huntingdon*'s Words plainly imply. He ſays farther, they were eight Years about it; which if we conſider the Circumſtances of the Country, will be no great Wonder it ſhould take up ſo much Time, unleſs their Forces had been very great, which we have no Warrant from any Hiſtory to ſuppoſe; for the Weald then uncultivated muſt have been moſt difficult to paſs, even in the drieſt Summers. The

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(*k*) Bedæ Hiſt. Eccleſ. lib. iv. cap. xiii.

(*l*) Ethelwerd Hiſt. lib. i. cap. v. Chronic. Saxon. Anno CCCCLXXVII. Hen. Hunt. Hiſt. lib. ii.

(*m*) Cambden Brit. Suſſex.

Downs, like a Wall, (with a Terrace-Walk on the top) have a very ſteep Deſcent into it, their whole Length; exceping, that every ten Miles, or thereabouts, they have deep Channels through them to afford Paſſage for the Rivers into the Sea: Therefore, what was then habitable, being thus canton'd out into ſo many Parcels by the Rivers, nothing could be more difficult to gain than thoſe Cantonments, were there any Forces to defend the Paſſes that ſhould have been attempted, the Rivers being deep and muddy, and the Moraſſes on each ſide broad and boggy: Hence we may conceive, it was no very difficult Taſk for the *Britons* to defend, nor an eaſy one for the *Saxons* to gain the Country. And indeed, the many old Camps, ſtill to be ſeen on the *Downs*, are an Evidence that ſcarce any Part eſcaped being a Scene of War. Mr. *Cambden* mentions but two, *Ciſſbury* and *Chenkbury*. In the new Edition of his Works, Dr. *Harris* has added three more; a *Roman* Camp at the *Brile* near *Chicheſter*, St. *Rook's-Hill*, and *Gons-Hill* near the Weſt Limits of the County. I ſhall here inſert an Account of the reſt; in which I ſhall firſt take notice of thoſe that are on the North Edge of the *Downs*, and overlook the *Weald*.

Camps *on the* Downs *on* Suſſex.

Firſt, *Chenkbury*, mention'd by Mr. *Cambden*, two Miles weſt of *Steyning*, and about three Miles North of *Ciſbury*; it is circular; its Circumference about two Furlongs. From *Chenkbury* eight Miles Eaſt, over *Poynings*, is a very large one, an Oval, not leſs than a Mile round; acceſſible at one narrow Neck only, and that fortified, with a deep broad Ditch, and a very high Bank: I could never learn any other Name it has gone by, than *Poor-Man's-Wall*, perhaps from its having been a Security to the diſtreſſed *Britons*. About three Miles Eaſt from thence is *Wolſenbury*, on a Hill, projected beyond the reſt of the *Downs*, like a Baſtion; it comes near a Circle in ſhape; its Diameter a little more than a Furlong. Near three Miles Eaſt of *Wolſenbury*, on the higheſt Part of the *Downs* in that Quarter, is a Camp, near ſquare, about 60 Rods long, and 50 broad, much like a *Roman* Camp; the ſide next the North is ſecur'd by the Precipice of the Hill, which is both very deep and ſteep; the other three Sides have each their *Portæ* after the *Roman* Manner ſtill very viſible; the Ditch ſeems to have been not leſs than eleven Foot broad; but the Ground having been ploughed, the Bank is but low: This is called *Ditchling*, as is the old Town under it. Near ſeven Miles farther Eaſt, and a Mile and half Eaſt of *Lewes*, is the laſt on the North Edge of the *Downs*; it goes by the Name of *Caburn*, which perhaps is but a Corruption of the *Britiſh* word *Cadir*; the Pariſh below it ſtill retains its *Britiſh* Name *Glynd*: This is a round Camp, ſcarce three Furlongs in Circuit, its Ditch very broad and deep, and the Rampart within very high; the Places where the Tents were pitch'd are yet viſible; which, from the Strength of the Out-Works, intimates that thoſe within held it no ſmall Time. Near a quarter of a Mile

Weſt of it there is a ſtrong Work much larger, but not ſo perfect; yet enough to ſhew it was made to ſecure a Power, that might lie there to bridle thoſe in the ſtrong Camp, and prevent their making Excurſions towards *Lewes*.

The Camps on the ſouthern Limits of the *Downs* are St. *Rook*'s near *Chicheſter*. *High-Down*, a ſmall Square, four Miles Eaſt of *Arundel*, and in the Pariſh of *Goring*. *Ciſbury*, four Miles South-weſt of *Steyning*. *Hollingbury* is the only one in the middle of the *Downs*, two Miles North of *Brighthelmſtone*, and three Miles South of *Ditchling*; it is a Square; the *Portæ* ſtill remaining; it contains about five Acres. A Mile Eaſt of *Brighthelmſtone*, on the top of a Hill, half a Mile from the Sea, is a Camp, which has a triple Ditch and Bank; this alſo is a Square, only the Corners are rounding; the outmoſt Trench meaſures about three quarters of a Mile. In the Pariſh of *Telſcomb*, about five Miles Eaſt of the laſt, are two, but moſt imperfect; the Cliff is a ſouth Fence to one; the other is a Mile diſtant from it; their weſt Sides are both finiſh'd with very able Works; they were deſign'd for Squares, and to contain 12 or 15 Acres. At *Meeching* or *Newhaven*, on the Point of the Hill, which overlooks the Harbour's Mouth from the Weſt, is a Fortification which they call *the Caſtle*; its Banks are very high, the Shape near half oval, containing about ſix Acres; formerly it might be much more, becauſe the Cliff, which forms the Diameter, every Year more or leſs moulders away, and falls into the Sea. Near a Mile eaſt of *Seaford* is another call'd alſo *the Caſtle*, bounded by the Cliff on the South; its Figure almoſt ſemicircular, the Trench and Rampart large, incloſing twelve Acres. Three Miles eaſt of *Cukmere*-Haven is the laſt, near a narrow Paſs coming up from the Sea call'd *Burling-Gap*; it incloſeth a Hill named *Belltout*, of a half oval ſhape; the Works have the ſame Figure, and meaſure about three quarters of a Mile; the Cliff here alſo makes the Diameter.

Though neither Hiſtory nor Tradition has handed to us any Relation when either of theſe Works were made, or by whom uſed, (except *Ciſbury* by *Ciſſa*) yet from this View we may conceive the Calamity of War once raged in all theſe Parts; that the Ground was diſputed Inch by Inch; that in the Attack, as well as Defence of it, the Pickaxe and Spade were as much made uſe of as the Sword; and laſtly, that, unleſs the Aggreſſors were very numerous, eight Years was no long Time taken up in diſpoſſeſſing the Inhabitants of this faſt Country.

Some may imagine many of theſe Camps were made by the *Danes*; but by what may be obſerv'd from the Hiſtory of thoſe Times, that People ſeemed not to be ſo formal an Enemy, as to prolong War by Encampments: Their Refuge was in their Fleets, that always attended them; ſo that when likely to be vigorouſly oppos'd, they betook themſelves to their Ships, and ſuddenly invaded another Part, where was leſs Oppoſition; and what they could not carry with them, conſum'd with Fire and Sword.

The Archdeacon of *Huntingdon*, in the Prologue or Dedication of his Annals, to *Alexander* Biſhop of *Lincoln*, aſſures his Dioceſan that he compiled his Hiſtory from Chronicles preſerved in ancient Libraries: No queſtion therefore, when ſpeaking of the *Saxons* here, he had good Authority to ſay (as above cited,) *magis magiſque ſibi Regionis ſpatia capeſſentes*; and that no other Meaning could belong to it, than that they carried their Conqueſt from Weſt to Eaſt, *in longinquam*, lengthways. Had they entirely made themſelves Maſters of the Country, it would have been too late: But before they had wholly gain'd it, the *Britons* aſſembled againſt them; the *Saxon* Chronicle ſays **neah**, i. e. *propè*; *Ethelwerd*, *juxta*; or, as *Huntingdon* has it, *apud* **Mercredesburne**; where a Battel was ſo hard fought, that each Side had enough on't, and retired. The *Saxons* were ſo diminiſh'd, that *Ella* was oblig'd to ſend for more Forces. This Action was in the ninth Year after *Ella*'s firſt Footing here, three Years before *Hengiſt*'s Death, *Ann. Dom.* 485. It ſo weaken'd *Ella*, that we hear no more of him till he receiv'd his Supplies from *Germany*; which came not, according to *H. Huntingdon*, till the firſt Year of the Emperor *Anaſtaſius*, three Years after *Hengiſt*'s Death, and ſix Years after the hard Battel, *viz. Anno Dom.* 491.

Being thus ſtrengthned, *Ella* mov'd again, beſieged *Anderida*, (in *Huntingdon*'s Words, *Urbem munitiſſimam)* at laſt forced the Place; and, by reaſon of the ſtout Reſiſtance the Defendants made, Savage like, left not a Soul alive, and razed the City, which in *Huntingdon*'s time remain'd deſolate.

As to the Field where the Battel was fought, the *Saxons* extending their Power eaſtward, the Check that was given them, in all probability, muſt have been where they puſh'd on their Victories; and it being near **Mercredesburne**, this *Bourne* near *Pevenſey* may be the Place meant, ſince it ſounds like the latter Part of that Name (for there not being a Weſt-*Bourne* that it relates to, the Name of it may rather be *Eſbourne* than Eaſt-*Bourne*; and likewiſe that *Anderida*, the *Britons* laſt Stake and Support, was not far from it. It is probable therefore, the Battel was fought on the *Downs*, between the Camp laſt mentioned at *Bourling-Gap* and Eaſt-*Bourne*; for there are no where on the *Downs*, that I have ſeen (and there are few Parts of them that I have not often view'd,) Marks of a greater Battle than there; becauſe from the Top of that very high Cliff, by the Inhabitants call'd *The three Charles* (and by Mariners *Beachy-Head)* to *Willington-Hill*, which is four Miles, the Ground is full of large *Tumuli* or Places of Burial and in many Parts within that Track, where the Poſition of the Groun ſeems to offer, there are deep Trenches and Banks, which one woul imagine were Breaſt-Works made to defend the Front of an Army and the *Tumuli* on each ſide of them ſeem to ſhew there was no ſmal Struggle in forcing, as well as defending them.

Mr. *Somner* (*n*) diſlikes, that the Site of *Anderida* ſhould be fix'd at *Newenden*, and is inclin'd to aſſign ſome Place in *Suſſex* for it: But from a Deference to the Opinions of the learned *Cambden* and *Selden*, he drops the Matter.

But let us ſee what our more elder Hiſtorians ſay of it. *Henry* of *Huntingdon*'s Words are: *Et quia tot ibi damna toleraverant Extranei, ita Urbem deſtruxerunt, quòd nunquam poſtea reædificata eſt. Locus tantum quaſi nobiliſſimæ urbis, tranſeuntibus oſtenditur deſolatus. Matthew* of *Weſtminſter* ſays, *Locus autem Civitatis uſque bodie tranſeuntibus oſtenditur deſolatus. Manſit ergo ibidem* Ella *cum tribus Filiis ſuis, & Regionem illam, quæ uſque bodie Anglicè* **Suthſex**, *Latinè autem Regio Auſtralium Saxonum dicitur, colere cæpit.* From the Expreſſions above-cited, it may be ſuppoſed the Ground where that City ſtood was not quite forgot in either of thoſe Hiſtorians Days. *Henry* of *Huntingdon* being the elder by 200 Years (had *Newenden* been the Place,) his words might have been true, in ſaying it was deſolate: But it is very improbable *Matthew* of *Weſtminſter* ſhould have ſaid ſo likewiſe; or, at leaſt, not taken notice of the Act of Piety and Charity of Sir *Thomas Albuger*, who, in his Time had newly erected a Monaſtery at *Newenden* for the *Carmelites*, who came from *Paleſtine*. But let that paſs: What Authority Mr. *Cambben* had for ſaying (*o*) *Hengiſt* ſent for *Ella* out of *Germany*, to help him reduce *Anderida*, is not to be found. From the Accounts above ſtated, and others that might be produced, it is clear, that *Hengiſt* was dead three Years before the Siege was laid to *Anderida*. In the Time of *Hengiſt*'s Life, we find for eight Years *Ella* had enough to do in *Suſſex*; and the Blow he had given him the ninth Year at **Mercredeſburne**, obliged him to be quiet the other two Years of *Hengiſt*, and till his Succours as (above-mention'd) came to him from *Germany*. Beſides, we have not the leaſt Hint from any of our *Hiſtorians*, that *Anderida* was an Eye-ſore, either to *Hengiſt*, or his Son *Eſk* after him; or that *Ella* aſſiſted the *Kentiſh Saxons*, or the *Kentiſh Saxons Ella* in reducing it: Therefore this muſt be a Suppoſition only of Mr. *Cambden*, in order to give Strength to the Notion of *Anderida*'s being at *Newenden*. Taking no Notice therefore of that Suppoſition, we may conſider *Newenden* is on the *Kent* ſide of the *Limen* (for ſo is the River *Rother* called (*p*) in the *Saxon* Annals, and by *Matthew Weſtminſter*; and the Mouth of it nam'd *Portus Limeneus*, and **Limene** by *Ethelwerd* (*q*) and *Henry Huntingdon*;) and that *Kent* having been ſubdued by *Hengiſt*, and his *Saxons*, near forty Years before, the Town at the Mouth of the *Limen*,

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(*n*) Somner's *Roman Ports and Forts in* Kent, p. 106. (*o*) *Cambd. Brit.* Kent. *Edit.* 1695. *Col.* 211.

(*p*) Chron. Sax. A. D. DCCCXCIII. Mat. Weſtm. Fl. Hiſt. A. D. DCCCXCIII.

(*q*) Ethelwerd. Lib. III. cap. iii. A. D. DCCCXCIII. Hen. Hunt. Hiſt. Lib. V. Alfr. Reg. An. 19.

Limen, and the reſt, if any, up the Stream on the ſide of *Kent*, were alſo part of their Conqueſt.

Furthermore, after it had coſt *Ella* ſo much time, and no doubt pains too, in reducing the plain Ground of *Suſſex*, it is not likely he ſhould call more Forces out of *Germany*, that he might lead them thirty Miles, through the Difficulties of the great Wood (which he muſt have done if *Newenden* were the Place,) to beſiege a City, ſo far from his own, and within the *Kentiſh-Saxon* Limits, eſpecially if there's any Heed to be given to the Words of *Matth. Weſtminſter* before-cited; who, after relating the ſad Fate of the Inhabitants and City of *Anderida*, immediately ſubjoins, *Manſit ergo, &c.* Ella *and his Sons reſided there* (*i. e.* in that Part of *Suſſex* where *Anderida* was,) *and began to cultivate and improve the Country.*

In the laſt Place, from the Uſe made of *Anderida* by the *Romans*, it is not likely (as Mr. *Somner* (*r*) judiciouſly hints) its Place was at *Newenden*; for being one of the Stations, under the *Præfectus littoris Saxonici*, where Forces were quarter'd, to have a watchful Eye on the Sea, whenever the *Saxon* Pyrates came to infeſt the Coaſt, we may ſuppoſe it like the reſt of the Gariſons under that Officer, conveniently ſituated for the ſame purpoſe; as were *Branodunum*, (*ſ*) *Brancaſter*, at the North Point of *Norfolk*; *Gariannonum*, North *Yarmouth*, or very near it; *Othona*, *Ithanchеſter* in *Dengy* hundred, in *Eſſex*, ſome Ages ſince ſwallowed up by the Sea; *Regulbium*, *Reculver* in *Kent*; *Rutupis*, *Richborow*; *Dubris*, *Dover*; *Lemanis*, (which from the *Saxon* Chronicle (*t*) we muſt look for, four Miles Eaſt of *Appledore*) probably *New Romney*, all ſituate near the Sea, on Ground which had a full Proſpect of the Sea: Whereas *Newenden* lies low, at leaſt eight Miles within *Appledore*, on a Turning of the River, where the Land eaſtward muſt have cut off any Proſpect of the Sea. To all this may be added, that the *Romans* having a *Numerus*, Cohort, or Battalion of the *Turnacenſes* in Gariſon at the *Portus Lemanis*, on the Mouth of the Haven, we may ſuppoſe they knew how to huſband their Strength to better purpoſe, than to place another Gariſon to watch the Motions of the *Saxon* Rovers, twelve Miles up the little River, quite out of ſight of the Sea, where they could be of no Service.

Thoſe who would have the Seat of *Anderida* to have been at *Haſtings*, let them look on theſe Words of *Henry Huntingdon*: (*u*) (*Haraldus rex Anglorum, eadem die reverſus ad* **Eouirwic**, *cum ſumma lætitia,*

(*r*) Somner Rom. *Ports and Forts*, pag. 103.

(*ſ*) Not. Imperii à Pancirol. cap. lxxiii. pag. 162.

(*t*) Chron. Sax. Ann. Dom. DCCCXCIII. *Tum appulerunt* (ſc. *Dani*) *in Limenis oſtium, cum* CCL. *Navibus. Super eum Fluvium traxerunt ſuas Naves uſque ad Sylvam, quatuor millariis ab exteriore parte æſtuarii; ibique expugnarunt quoddam munimentum* (ſc. *Apuldre.*)

(*u*) *Henr. Huntingdon*, Hiſt. Lib. VI.

tia, dum pranderet, audivit nuntium dicentem ſibi, Willielmus dux Normanniæ littora Auſtralia occupavit, & caſtellum conſtruxit apud Haſtings,) and they will conclude *Haſtings* was not a deſolate Place, in the Ages of the Hiſtorians, who affirm *Anderida* was. If at *Pevenſey*, that Place was ſo far from being razed by *Ella*, that even after the *Norman* Conqueſt it remain'd a ſtrong Caſtle, where *Odo*, Biſhop of *Bayon*, and his Forces ſuſtain'd a ſix Weeks Siege; and for want of Proviſion were oblig'd to ſurrender to K. *William* II. At this Time there is ſo much of *Pevenſey* ſtanding, that perhaps 'tis the greateſt and moſt entire Remain of *Roman* Building any where to be ſeen in *Great Britain.*

From the Arguments on the foregoing Authorities, *Anderida* muſt have been ſomewhere in *Suſſex*, not in the Weſt, but Eaſt part of it, and not far from the Eaſt end of the *Downs*, near the Sea. From the Bath, Pavement, Coins, and Bricks, 'tis ſure the *Romans* had once an Abode, and not a ſhort one, at this Place near *Eaſt Bourne*: From the large Extent of Foundations about the Place where theſe were diſcover'd, that there was a large Town or City there: From the common Height thoſe Foundations bear under the Surface of the Ground, that the Buildings they ſuſtain'd were effectually levell'd or raz'd: And from the Coals dug up amongſt the Rubbiſh, 'tis evident that Part was burnt; all which Circumſtances well enough agree with the Account given us of *Anderida*.

The Situation likewiſe of a Town here, gives reaſon enough to ſuppoſe, it was a Place of Importance, and whence it had its Name; no Part hereabouts being any way ſo convenient for a ſecure Settlement, or for ſuch a Uſe as the *Romans* might have occaſion to make of it. We are inform'd by *Cæſar*, that the Maritime Parts of *Britain* (ſpeaking of what he ſaw, which was the South-Eaſt) were inhabited by People from *Belgium*; and (*w*) that they call'd their Settlements by the Name of the Places from whence they came. It was the Opinion of *Tacitus* alſo, that (*x*) thoſe who inhabited next to *Gaul*, came from *Gaul*. And *Bede* ſays, the Tradition in his Time was, that the Southern Part of the Iſle was peopled (*y*) from *Bretaign*. In the third and ſeventh Books of *Cæſar*'s Commentaries, mention is made of the *Andes*, a City and People belonging to it among the *Celtæ*, inhabiting on the Sea-Coaſt. Time varying the Names of Things, near two hundred Years after *Cæſar*, *Ptolemy* calls the City *Anderidum*: And near 250 Years after him, when the *Noti-*

(*w*) De Bell. Gall. Lib. V. *Qui omnes, ferè iis nominibus civitatum appellantur, qui-orti ex civitatibus eo pervenerunt.*

(*x*) Tacit. Agric. cap. xi. *In univerſum tamen æſtimanti, Gallos vicinum ſolum occupaſſe credibile eſt.*

(*y*) Bedæ Hiſt. Eccleſ. Gent. Angl. Lib. I. cap. i. *In primis hæc Inſula Britones ſolum, à quibus nomen accepit, incolas habuit; qui de tractu Armoricano (ut fertur) Britanniam advecti, Auſtrales ſibi partes illius vindicarunt.*

tia Imperii, now extant, was in uſe, that *Claſſis Anderetianorum* (z) is regiſter'd; and the Reſidence of their Admiral fix'd at *Paris*. From whence 'tis to be inferr'd, that tho' the Capital of the *Andes* might have been *Angers* near the *Loyre*, yet their Country had on the North the *Britiſh* Channel, and on the Eaſt the *Seine* for its Bounds. The *Britiſh* Coaſt about *Eaſt-Bourne* is the neareſt of any to the Mouth of the *Seine*: Therefore, according to the Uſage before *Cæſar*'s Time, the Name of *Anderida* there is already accounted for. Moreover, this Place ſeems moſt naturally ſeated, for giving an Appellation to the great Wood, to which it is adjoin'd: For, as itſelf is on the Shore, ſo alſo the *Sylva Anderida* here, came very near the Shore; and a large Part of it might be ſeen from the Sea before it: Indeed, on the Sea off of *Romney*, it might be diſcover'd; but then the Diſtance was great: At all other Parts of the Coaſt, the Sight of it from Sea is hinder'd by Hills, or high Cliffs.

Setting aſide the Want of a navigable River, the Spot of Ground where this old Town ſtood, yields to none in the County for Importance and Pleaſure; for here, like a Wedge, ends the firm Soil of the *Downs*; Nature has ſhap'd it like an Equilateral Triangle, having each Side half a Mile in Length: Towards the Sea, on the ſouthern Side, 'tis fenc'd by a low Cliff, of 12, 15, and in ſome Places 20 Foot high, (in which Cliff is now to be ſeen a ſtrong Foundation, that has acute Angles, which ſhews it to have been for a Fort, rather than a Dwelling-houſe. On the Northern Side is a Moraſs, with a large Rivulet of very good Water. Between the Weſt-ſide and the *Downs* lies a ſmall Valley, by which Advantage, there was formerly a Harbour, capable of a ſmall Fleet; the Banks on each Side of it are an Evidence it was ſunk by Induſtry; but by Weeds and Gravel from the Sea, and by Mould annually added, as is obſerveable † in Valleys, it is now ſo rais'd, that 'tis never flow'd but at high Spring-Tides, when a ſtrong Wind forces the Waves into it. This Harbour muſt have been a good Security to part of the Weſt-ſide; what other Works might have been to guard it, from the End of the Harbour to the Moraſs, cannot be ſaid, by reaſon the Ground between has for many Ages been in Tillage. It is eaſy to imagine of what Importance a Town fortified at this Place muſt have been in thoſe Ages, when the only Paſs by Land from the Weſt to the Eaſt End of the Country was through it; for other there could not be in many Miles North; unleſs the Lands in that Tract, which are ſtill very oozy and tender, had been well drain'd.

† *Vid.* ſupr. V. iv. P. ii. C. iii. S. viii.

As the Situation deſcrib'd render'd this Place ſtrong, it is very pleaſant withal; for the Ground is high enough for a good Proſpect of the Low Lands adjoining, and the Country towards *Battel*; beſides, it has a commanding View over that Bay, which is between *Beachy-Head* and *Haſtings*. If the Uſe made of it by the *Romans* was to guard the Coaſt, there was this Advantage belonging to it; that a Centinel on the Top of *Beachy*, not two Miles from it, in a clear Day, without turning his Body, might ſee the *Iſle of Wight*, the Hills in *France* near *Bologn*, and the *Neſs* in *Kent*; ſo that from the *Neſs* to *Selſey* it muſt have been a ſmall Sail that could eſcape his Eye.

(z) Pancirol. Comm. in Not. Imp. Cap. XC. pag. 179, 180.

The Situation *of the Ancient* Carteia; *and other* Roman Towns *near it*; *by* J. Conduit, *Esq*; n. 359. p. 903. Fig. 58.

XXIII. About four *Engliſh* Miles N. W. from *Gibraltar*, at the End of the Bay, there are conſiderable Ruins. The Place is called at preſent *Rocadillo*, and conſiſts of a few Huts, and a modern ſquare Tower, which appears to have been raiſed on the Foundation of a much greater Pile. The Walls of the old City are very eaſy to be traced. They ſeem to have been about two *Engliſh* Miles in Circumference, and were built upon the Brow of the riſing Ground. The Space within is cover'd with Ruins, among which were a great many Pieces of very fine Marble well wrought; and innumerable Fragments of Veſſels of that kind of red Earthen Ware, which *Ambroſio Morales* in the firſt Chaper of his *Diſcurſo de las Antiguedades de las Ciudades de Eſpanna*, lays down for a certain Mark of a *Roman* City, and takes to have been a Compoſition of the Clay of *Saguntum*, often mentioned among the *Romans*.

Ficta Saguntino pocula malo luto. Mar. Lib. VIII. Ep. 9.

Sume Saguntino pocula ficta luto. Lib. IV. Ep. 108.

There are Remains of a rude ſemicircular Building, raiſed on Arches, which deſcends gradually into an Area, and ſeems to have been a kind of Theatre. I brought away with me a Marble Pedeſtal of a Statue, dug up near to the ſquare Tower. The Marks, where the Feet and the Extremities of the Drapery were faſten'd to it, are ſtill to be ſeen, and the following Letters finely cut, VARIA MARCE. It was given me by the Owner of the Ground, who ſaid he had read upon it formerly three other Letters LLA ſince broken off. There are other Inſcriptions, but ſo defaced and ill cut, that they do not deſerve a particular Mention. I have a conſiderable Number of Medals, that were found among theſe Ruins; moſt of them have a *Caput turritum* with CARTEIA in very legible Characters. The Reverſe is generally a *Fiſh*, a *Neptune*, or a *Rudder*. Towards the Weſt there is an eaſy Deſcent to the River *Guadaranque*, which takes its Source at *Caſtellar*, about four Leagues in the Country, and is very deep at *Rocadillo*. There is a Bar where the River falls into the Bay; but it does not hinder the Entrance of Veſſels of 15 Tun, to load Charcoal and other Neceſſaries, that are ſhipt off from thence for *Ceuta*. Along the ſide of the River there is ſtill a great deal of Stone Work, and viſible Remains of an ancient Key. At a ſmall Diſtance to the Eaſt, upon an Eminence, there are conſiderable Ruins of a ſquare Caſtle, which appears to have been an ancient Building of very great Strength. The Country People now call it *Caſtillon*, but the *Corrigidor* of that Diſtrict told me he remember'd it call'd *Torre Cartagena.* The Situation agrees exactly with the Tower of that Name, mention'd in the 274*th* and 316*th* Chapters of the Chronicle of *Alphonſo* XI. of *Caſtile*; a Book of great Authority among the *Spaniards*, who are generally of Opinion that it was formed upon the Memoirs of *Fernando Nunnez de Valladolid*, a Favourite and Miniſter of that King, though it goes under the Name of another Perſon.

All the *Spaniards*, who live about the Ruins I have been deſcribing, ſay they are the Remains of a City of the *Gentiles*, called *Cartago.* The Corruption of *Carteia* into a Name ſo much more talk'd of, might eaſily happen in an Oral Tradition of ſo many Years; and I cannot help thinking, that where other Circumſtances concur, an Account deliver'd down from Father to Son is an Evidence not to be ſlighted in Matters of ſo much Obſcurity.

Frequent mention is made of *Carteia* by the ancient Geographers and Hiſtorians. I build ſo much on two Paſſages of *Livy*, that I ſhall inſert them at Length. The firſt is Lib. XXVIII. cap. 30. (*Livy* does not mention from what Port *Lælius* ſailed for *Carteia*; but by what goes before, it ſeems to have been from *Cartagena* at that time *Scipio*'s Head Quarters)——Lelius *in the mean time, paſſing from the Streights into the Ocean, arrived with the Fleet at* Carteia. *(This City is ſituated upon that Part of the Sea Coaſt, where the Streights firſt expand themſelves into the Ocean.) There was great Reaſon to hope, as I ſaid before (from Perſons who promiſed it, coming voluntarily over to the* Roman *Camp) that* Cadiz *would be ſurrender'd by Treachery without any Reſiſtance. But the Plot was diſcover'd before it was quite ripe, and* Mago *having laid hold of all the Conſpirators deliver'd them to* Adherbal *the Prætor to be ſent to* Carthage[*]. Adherbal, *having put the Conſpirators into a five oar'd Galley, and ſent it before, becauſe it was ſlower than the three oar'd ones, he himſelf followed with eight of the latter at a proper Diſtance. The five oar'd Galley had now enter'd the Streights, when* Lælius, *who had ſet out from the Port of* Carteia *in one of the ſame kind, followed by ſeven three oar'd ones, made up towards* Adherbal *in his three oar'd Galley, believing that the five oar'd one being got fairly into the Streights, could not return againſt the Current.* Adherbal *heſitating a little in ſo ſudden an Affair, was uncertain whether he ought to follow the five oar'd Galley or turn about towards the Enemy. His deliberating took it out of his Power to delay the Engagement, for now they were within Reach of one another's Darts, and the Enemy was cloſe upon them on all ſides. The Current*

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[*] Now *Carthagena.*

likewiſe took it out of their Power to guide the Veſſels, nor did it reſemble a Sea Fight, becauſe there was nothing voluntary, nothing of Art or Deſign in it. The unruly Streights and Tide manag'd the Conteſt as they pleaſ'd, daſhing the Veſſels againſt one another, mingling them together, and toſſing them up and down in ſpite of the Rowers; ſo that you might ſometimes ſee a flying Veſſel driven back full againſt the one in purſuit of her, and the one that was purſuing fly from the one purſued, juſt according as the Tide and Waves directed. Juſt as ſoon as one Galley was going to drive againſt another with its Beak, the other would daſh its Prow againſt it while thus turn'd oblique: And another now preſented with its broad Side to the Enemy, being immediately turn'd about would hit her with her Prow.

The other Paſſage is *Lib.* XLIII. *Cap.* 3. —— *And there was another Deputation came from* Spain *of a new Race of Men, about four thouſand in Number, who ſaid they were begot upon* Spaniſh *Women by* Roman *Soldiers, but without being married, and requeſted that they might have a Town to live in. By a Decree of the Senate they were ordered to give in their Names to* L. Canuleius; *and if he made any of them free, he was deſired to ſend them to* Carteia *by the Ocean. And they who had a mind to remain at* Carteia *ſhould be numbred amongſt the Inhabitants, and have a Piece of Ground allotted them. That it ſhould be a* Latin *Colony, and call'd that of the free Men.*

The beſt *Spaniſh* Authors, and *Ortelius* and *Cellarius* truſting to them, take this *Carteia* of *Livy* to be different from that which was the next to *Calpe*, and place it generally about *Conil*. *Rodrigo Caro*, in his *Convento Juridico de Sevilla*, C. 24. applies the *Carteia* in the XLIII Book of *Livy* to *Rocadillo*, and in Cap. 74. to *Carteia* near *Lepe*. It is ſurprizing he takes no notice of the Paſſage in the XXVIII Book; for the particular mention of *ad Oceanum*, and *Urbs ea in orâ Oceani ſita eſt*, implies they both relate to the ſame Place; perhaps it was becauſe he could not reconcile it with his *Carteia* near *Lepe*. *Cellarius* makes *Bæſippo* this *Carteia* of *Livy*, Lib. ii. c. 1. Bæſippo, *quæ videtur* Carteia Livii *eſſe, extra fretum & columnas poſita. Aliam pro* Livio Carteiam *non invenio*; tho' in all the ancient Geographers *Bæſippo* is mentioned by itſelf as a diſtant Town. I am ſo far from ſeeing any Neceſſity of erecting a new *Carteia* in the Ocean for theſe Paſſages in *Livy*, that I take that in Lib. XXVIII. to be rather a Proof that the City there mentioned ſtood at *Rocadillo*. It certainly agrees much better with that Situation, than with *Conil* or *Carteia* near *Lepe*. It is not to be reconciled with the latter, becauſe that lies North Weſt of *Cadiz*, from whence *Adherbal* ſet out for *Carthage*, and is a good way up the Country, on the Side of a River, and not in *orâ Oceani*. Neither can *Conil* be ſaid properly to be ſituated *ubi primum è faucibus anguſtis panditur mare*; for the Sea widens conſiderably before it reaches the Capes *Spartel* and *Trafalgar*, and becomes an Ocean where that Town ſtands. It is obſervable that *Mela* applies Words of the ſame Import with thoſe of *Livy* to the Sea between

Fig. 58.

Calpe and *Abila*. *Barbeſul*; *Aperit deinde anguſtiſſimum pelagus.* There is no Harbour at *Conil*, or any other Place between Cape *Trafalgar* and *Cadiz*. If the *Carthaginian Quinqueremis* had only *been going into* (*intrabat*) the Mouth of the Streights between Cape *Spartel* and *Trafalgar*, *Lælius* could not have believed it *ſatis deprehenſam rapido in freto, in adverſum æſtum reciprocari non poſſe*, for there is no ſuch ſtrong Current there; and the Action between him and *Adberbal*'s *Triremes*, which were at ſome diſtance behind the *Quinqueremis*, muſt have happened *Weſtward* of thoſe Capes; which is inconſiſtent with the Deſcription *Livy* gives of it; becauſe in that Part of the Ocean there are none of thoſe Eddies, that appear to have had ſo particular an Effect on both the Fleets, during the Engagement, and are peculiar to the middle of the Gut.

This general Miſtake ſeems to have been occaſioned by giving too eaſily into the Opinion, that *Livy* underſtood by the *Fretum* all the Sea between the Capes *Spartel* and *Trafalgar*, and the Rock of *Gibraltar*, and *Apes-Hill*; when it is more probable that he termed ſtrictly ſo only the narroweſt Part, which was generally reckoned to be between the two latter. *Mela. Proxima Africæ & Europæ littora montes efficiunt Calpe & Abila.* *Pliny* takes *Mellaria* to be neareſt to *Africk*, and therefore places there the *Fretum ex Atlantico mari*, *Lib*. 3. which is an Argument his *Fretum* was not the ſame with our Streights, and that he carried the Atlantick Ocean much farther *Eaſt* than the Capes *Spartel* and *Trafalgar*.

Other Authors ſeem to make the Pillars of *Hercules* the Boundary of the *Mediterranean* and the Ocean. *Marcianus Heracleotes.* Ἐνταῦθα πέρας ἔχει τῆς Βαιτικῆς Ἱσπανίας τὸ μέρος τὸ παρῆκον παρ' ἑκατέρας τὰς θαλάσσας τὰς περὶ τὸν Ἡράκλειον πορθμὸν τυγχανούσας, τήν τε καθ' ἡμᾶς καὶ τὴν ἔξω, τοῦτ' ἔστι τὸν Ὠκεανόν. *Hic finem habet Hiſpaniæ Bæticæ pars contingens utraque maria circa fretum Herculeum, tam mare noſtrum quam mare exterius, h. e. Oceanum.* Τῆς μὲν Βαιτικῆς τὸ πλεῖστον πρὸ τῆς καθ' ἡμᾶς κεῖται θαλάσσης, τῶν Ἡρακλείων ἐντὸς στηλῶν, μέρος δέ τι παρὰ τὸν δυτικὸν Ὠκεανόν. *Bæticæ quidem pars maxima prætenditur noſtro mari, Herculeas intra columnas, pars vero quædam occidentali Oceano.*

Polybius, *L. III*, Καλεῖται δὲ τὸ μὲν παρὰ τὴν καθ' ἡμᾶς παρῆκον ἕως Ἡρακλείων στηλῶν, Ἰβηρία. Τὸ δὲ παρὰ τὴν ἔξω καὶ μεγάλην προσαγορευομένην κοινὴν μὲν ὀνομασίαν οὐκ ἔχει, διὰ τὸ προσφάτως κατωπτεῦσθαι *Quæ porrigitur ſecundum mare noſtrum portio ad columnas uſque* Herculis *Iberia nominatur; quæ ſecundum mare externum quod & magnum appellatur, communem appellationem nondum invenit, quia non diu eſt cum fuit explorata.*

Appian, L. II, Ἐμφυλ. περά τε τὰς στήλας τὰς Ἡρακλείους τὸν ὠκεανὸν ἐπίγων. *Trajecto ad Columnas Herculis Oceano.*

Florus. Lib. IV. Cap. 2. Varus *and* Didius *the Deputies engaged in the very Mouth of the Ocean, but the Conflict with the Sea was greater than that of the Ships with one another. For the Ocean, in order to chaſtiſe, as it were, the* Romans *for their Madneſs, ſhipwreck'd both the Fleets.*

Fleets. What a horrible Action must it be, where the Winds, Waves, Men, Ships and Tackle were all confusedly engaged? Add to these the Fear of the Situation itself, the Shores of Spain *and* Africa *joining almost into one; a Sea both within and without, and* Hercules's *Pillars hanging over their Heads; while all around was raging with the Storm and Fight.* Here the Pillars of *Hercules* are made the very Mouth of the Ocean. If you underſtand the *Fretum* of *Livy* in this Senſe, and reckon it to ſignify only the Sea between *Calpe* and *Abila*, and the Ocean to begin from thence *Weſtward*, the Paſſage in the 28*th* Book is an accurate Deſcription of *Rocadillo. Lælius interim freto in Oceanum evectus ad Carteiam claſſe acceſſit. Urbs ea in orâ Oceani ſita eſt, ubi primum è faucibus anguſtis panditur mare.* And allowing *Lælius* to ſet out againſt *Adherbal* from thence, every Circumſtance mentioned by *Livy* is ſo eaſy to be accounted for, that it is needleſs to make Application. A Paſſage in *Dion Caſſius*, Lib. XLIII. induces me to believe the Veſſels anchored in the *Guadaranque*, and that that River, and not the Bay, was properly *Portus Carteiæ.* Οὐαρος δὲ ὑπὸ τοῦ Διδίου περὶ Κραντίαν ἐναυμαχήθη, καὶ ἔργω μὲν προκαταφυγὼν ἐς τὴν γῆν, ἀγκύρας ἐς τὸ στόμα τοῦ λιμένος ἀλλήλας πρὸς ἄλλαις προσεμβεβλήκει καὶ περὶ αὐτὰς οἱ πρῶτοι τῶν διωκόντων σφᾶς, ὥσπερ περὶ ἕρμα ἐπταίκεσαν, πᾶν ἂν τὸ ναυτικὸν ἀπολώλεκει. Varus *vero à* Didio *apud* Crantiam *navali prælio ſuperatus in terram evaſit, conjectiſque in introitum portûs ancoris, ita ut una ab alia teneretur, cum ad eas, tanquam ad ſeptum quoddam, primæ inſequentium naves offendiſſent, periculum totius claſſis amittendæ declinavit.* This cannot be underſtood of the Bay, becauſe that is three Leagues over at the narroweſt part, and much too deep for a Work of ſuch a nature, which might eaſily have been effected upon the Bar of the River *Guadaranque.*

There is no room to doubt of the Emendation *Luis Nunnes*, in his *Hiſpanica*, has made here of Καρτηία for Κραντία; for no antient Author mentions any other Town or Harbour thereabouts of a Name like that; and *Carteia* was the Place which held out the longeſt for the younger *Pompey*, and where he kept his Fleets.

Florus, in the Paſſage I have already quoted, relating the ſame Action between *Didius* and *Varus*, repreſents in very lively Colours the very Scene near *Rocadillo. Adde ſitus ipſius formidinem, vergentia in unum hinc Hiſpaniæ inde Mauritaniæ littora; mare inteſtinum & externum, imminenteſque Herculis ſpeculas*, &c.

Hirtius, in the latter end of his Book *de Bello Hiſpanico*, ſays *Cn. Pompeius ad navale præſidium parte alterâ contendit* Carteiam, *quod Oppidum abeſt à* Corduba *millia paſſuum* CLXX. which Diſtance, as well as the Circumſtance of *navale præſidium*, agrees with the Situation of *Rocadillo.* The ancient Geographers place *Carteia* next to *Calpe* Weſtward. *Pomponius Mela*, after having given us a perfect Picture of *Calpe*, and deſcribed thoſe laſting Marks, in which ſo many Centuries have made no Alteration, ſays——*Sinus ultra eſt; in eoque Carteia. Strabo*, L. III. Ἐνταῦθα δὲ ὄρος ἐστὶ τῶν Ἰβήρων ἡ Κάλπη, &c. καὶ πρὸς αὐτῷ

Κάλπη

Καλπὴ πόλις ἐν τεσσαράκοντα σταδίοις, ἀξιόλογος ϗ παλαιά, ναυσταθμὸς ποτὲ γινομένη τῶν Ἰβήρων. Ἔνιοι δὲ ϗ Ἡρακλέους κτίσμα λέγουσιν αὐτὴν, ὧν ἐστὶ ϗ Τιμοσθένης, ὅς φησι ϗ Ἡράκλειαν ὀνομάζεσθαι τὸ παλαιὸν, δείκνυσθαί τε μέγαν περίβολον ϗ νεωσοίκους. *Ibi mons* Hiſpaniorum *eſt* Calpe, &c. *& ad* XL *inde Stadia Urbs* Calpe *vetuſta & memorabilis, olim Statio navibus* Hiſpanorum. *Hanc ab* Hercule *quidam conditam aiunt, inter quos eſt* Timoſthenes, *qui eam antiquitùs* Heracleam *fuiſſe appellatam refert, oſtendique adhuc magnum murorum circuitum & Navalia. Caſaubon*, in his Notes on this Paſſage, is of opinion it ſhould be Καρτηΐα πόλις· *Legendum cenſeo* Καρτηΐα πόλις, *nam eam urbem hic intelligi res ipſa docet ; & ex eo colligi poteſt, quod toties eam infra nominans nihil tamen de ejus ſitu alidi dixiſſe reperitur. At* Calpen *Urbem nemini Veterum ne nominatam quidem reperio.*

Marcianus Heracleotes makes *Carteia* 50 Stadia from *Calpe*. Either of theſe Diſtances agrees with *Rocadillo*, according to the part of the Rock from which they reckon ; for it is above ſix Miles from *Europa* Point to *Rocadillo*.

Bochart, in his *Geographia Sacra*, Lib. I. cap. 34. ſtrengthens *Caſaubon*'s Opinion: *Nec fruſtrà* Heraclea Carteiæ *fuiſſe vetus nomen, tanquam ab* Hercule *conditore.* Herculem *enim ſuum* Phœnices Μέλκαρθον *appellabant.* Philo Biblius *ex* Sanchoniathone *apud* Euſebium, L. I. *Præparat.* Τῷ δὲ Δημαροῦντι γίνεται Μέλκαρθος ὁ ϗ Ἡρακλῆς. *Ex* Demarunte *autem natus eſt* Melcarthus *qui &* Hercules. Μέλκαρθος *autem eſt* קרתא מלך Melech Kartha, *Rex urbis, i. e.* Tyri. *Idem* Græcis Melicertes *ſive* Palæmon *Maris Deus, quem* Cadmi *nepotem eſſe fingunt. Hinc* Heſychius *rurſus* Μάλικα τὸν Ἡρακλέα Ἀμαθούσιοι. *Omnino igitur ex* Melcartho, vel קרתא מלך Melech Kartha. *Urbs quam ad* Calpen *condidit* Hercules Phœnicius, primo Melcartheia *vocata eſt*, Melech Karthiia, *quaſi* Ἡρακλείαν *dixeris ; deinde per Aphæreſin* Cartheia *vel* Carteia. *Apud* Hæbreos *frequens eſt hæc Aphæreſis in nominibus locorum compoſitis. Tale* Sittim *pro* Abel Sittim, Salem *pro* Jeruſalem, &c.

I have ſome Medals that were dug up at *Rocadillo*, with the Head and Club of *Hercules* upon them ; which ſeem, in ſome meaſure, to ſupport that great Man's Aſſertion. Upon the reverſe are Tunny Fiſhes, which according to *Strabo* and *Pliny* abounded formerly near *Carteia*, and are ſtill taken in great Quantities near the Shoar of the Eaſt Sea, at a ſmall diſtance from *Rocadillo*.

Bernardo Aldrete, an Author of great Weight, in the ſecond Book and ſecond Chapter of his *Antiguedades de Eſpanna*, accounts for the Addition of *eia* to *Cartha* ; which in the *Syriack* and *Chaldean* ſignifies *Pulcher*, *Formoſus*, and was affixed to the Name of this City, to diſtinguiſh it from the *Cartha* in *Syria*, mention'd in the 21*ſt* Chapter and 34*th* Verſe of *Joſhua*.

By all Accounts the *Phœnicians* founded moſt of the Cities on this Coaſt, and probably *Carteia* was one of their earlieſt Settlements ; for it lies very near *Africk*, in a moſt inviting Situation, having on one ſide a Bay, and on the other a River, which waters a rich Country. Its Height gave it Strength and a very beautiful Proſpect, Circumſtances which ſeem to juſtify *Aldrete*'s Interpretation of the latter Part of its Name.

In the Itinerary of *Antoninus*, it is *Calpe-Carteiam*; not *tanquam duæ urbes diverſæ*, as *Caſaubon* intimates in his Notes on the third Book of *Strabo*, for then it would be *Calpen Carteiam*; nor, according to *Surita*'s Comment on that part of the Itinerary, *ut ſignificet non rectâ iter ex* Suel Carteiam *deduci, ſed paululum ad* Calpen *deflecti*; becauſe *Calpe* ſtands at the end of a narrow Neck of Land, which projects to the *Southward* a great way from the reſt of the Continent; and conſequently is quite out of the Road from *Suel* to any other place *Weſtward* of it; probably *Calpe-Carteia* is for *Carteia ad Calpen*, to diſtinguiſh it from the other *Carteia* in *Celtiberia*, mentioned in the 21*ſt* Book and 5*th* Chapter of *Livy*: For, as *Caro* obſerves, there is no Neceſſity for the Alteration *Sigoneus* has made in that Paſſage of *Althæa* for *Carteia*, from the Text of *Polybius*; becauſe *Livy* never mentions the other *Carteia*, without adding *ad* Oceanum, *Urbs ea in ora Oceani ſita eſt*; which diſtinction were needleſs, had there been only one City of that Name. *Strabo*, in his third Book, mentions a City called καρταλίας, and places it near *Saguntum*, which is agreeable to the Situation given this *Carteia* by *Livy*.

I am very much ſurprized that *Mariana*, and ſeveral others, ſhould take the preſent *Gibraltar* to have been the ancient *Heraclea*, when neither *Pliny*, who reſided ſo long in thoſe Parts, *Mela*, who was born there, nor any antient Geographer or Hiſtorian that I have met with, makes the leaſt mention of ſuch a City thereabouts, except *Strabo*, and he places it 40 Stadia from *Calpe*, at the foot of which *Gibraltar* is ſituated. The *Spaniſh* Hiſtorians give good ground to believe there was no Town upon that Mountain till the *Moors* invaded *Spain* under *Tariff*, who gave it the Name it has retained ever ſince. I ſhall not enter into the detail of the Reaſons of thoſe Authors who place *Carteia* at *Tarifa* or *Algezeira*: The true one ſeems to have been, their not knowing any other Place which agreed better with the old Accounts of *Carteia*, or where the Ruins of a City, which made ſo great a Figure, could be buried: The common Practice of Authors who deſcribe Places they have not ſeen. This appears to have been the Caſe of moſt of thoſe, eſpecially *Mariana*, who, had he been in theſe Parts, would not have been guilty of the Overſight he has committed, Lib. XVI. Cap. IX. where he places two Bays in the *Streights*, one at *Gibraltar*, and the other at *Tarifa*; which Error he was probably led into by another. For, giving into the Opinion that *Tarifa* was the ancient *Carteia*, and finding that City placed in a Bay by *Mela*, he concluded there muſt be one at *Tarifa*, which is an open Road, and ſo much expoſed, that in the leaſt bad Weather the ſmalleſt Veſſels muſt be hauled aſhore. Which Circumſtance alone is a ſufficient Proof of its not being *Carteia*, by all Accounts a famous Harbour.

Though there are very great Ruins at *Algezaira*, they are not ſuch as give any room to believe they are the Remains of a *Roman* City. For neither Pieces of Marble, nor Inſcriptions are found there, nor any *Roman Coins*. The Circumſtance of *Varus*'s ſhutting up the Mouth of the Harbour of *Carteia*, and the diſtance of 40 or 50 *Stadia* from *Calpe*, are not applicable either to *Tarifa* or *Algezeira*; and if one of thoſe Towns was *Carteia*, to what City belong thoſe Ruins I have been deſcribing? ſince all the antient Geographers make *Carteia* not only the neareſt Town to *Calpe*, but the only one in that Bay. There is better ground to believe *Tarifa* ſtands on the Ruins of another Town, as I ſhall ſhew.

Ruins at Ximena.

I ſhall firſt mention ſome Ruins I ſaw at *Ximena*, an inland Town, about five Leagues North from *Gibraltar*, ſituated on a rocky Hill, at the Bottom of which to the Eaſtward is a very plentiful Country, waſhed by the *Joſgarganta*, a ſmall Branch of the River *Gaudiaro*. On the top of the Hill is the old Town, which by the Arches and Vaults appears to have been built by the *Moors*. On the Right-hand Corner of the ſecond Gate of it, there is a coarſe Stone with Mouldings on the Edges, which has the following Inſcription.

L. HERENNIO HE
RENNIANO
L. CORNELIVS HEREN
NIVS RVSTICVS
NEPOS EX TESTA
MENTO POSVIT
NONIS MARTIIS
SEX. QVINILIO CON
DIANO SEX. QVIN
TILIO MAXIMO COSS.

Rodrigo Caro, in his *Convento Juridico de Sevilla*, C. 13. ſays he ſaw the beginning of this Inſcription in *Bejer de la Miel*; but when I was in that Town, I was informed by a very intelligent Perſon, that there is no *Roman* Inſcription in any part of it. The Author of *Cadiz el Emporio del Orbe*, when he inſerts this Inſcription, makes it SEXOVINTILIO CONDIMIO; but the Daſh of the Q is very plain, and the other Word ſeems rather CONDIANO. The *Latin Faſti* in A. U. C. 903. place Conſul.

SEX. QVINTILIVS GORDIANVS
SEX. QVINTILIVS MAXIMVS.

But the learned Dr. *Bentley* has obſerved to me, that the *Greek Faſti* and *Dio* call him κονδιανὸς, which Reading is confirmed by this Inſcription.

I have brought with me from this Town a Piece of Marble with the following Words upon it.

AVCTINVS CLEMEN
TIS SIBI
ET SVIS BRITTÆ
MATER AN LX
H.S.E. SIT T.T.LEVIS.

I ſaw another on the Wall of the great Church, which ſeems to have been the Baſe of a Statue; the Inſcription is as follows.

RESPVBLICA OBEN
SIS E..LO DATO
DEDI...VIT CVRAT
LIBE..OR H..REN
NIO RVSTICO H.M.
SINILO RESTITVTO
II VIR.

The Manner in which the *Moors* have placed theſe Inſcriptions plainly ſhews the little Value they ſet upon them, and there is ſo great a plenty of Stone on the Rock where *Ximena* ſtands, that it is not to be thought they would fetch them for ſuch an Uſe from any diſtant Place; which induces me to believe a *Roman* Town formerly ſtood there, called OBA.

I do not find any Town of that Name in the antient Authors. *Strabo*, L. III. mentions Σβνοϐα Μαίνοϐα ϗ ἄλλαι πλείους, which may poſſibly comprehend *Oba*. The *Geographia Nubienſis*, in the fourth *Clima*, makes a Town called *Rotban* the firſt Station from *Algezeira* to *Seville*, which perhaps may have been this *Oba*; for it is about a Day's Journey from *Algezeira*, and in the direct Road from thence to *Seville*.

Mariana places, *Lib.* iii. *Cap.* ii. the Cave where *Craſſus* hid himſelf near *Ximena*; the Marks of it given by *Plutarch*, are common to moſt others. I went three Leagues in ſearch of it; but the Country People having a Notion that there is a Treaſure in it, and not being to be perſuaded that I would take ſo much pains out of pure Curioſity, would not ſhew me the Way, though they acknowledged there were ſeveral ſuch Caves thereabouts. I cannot help taking notice of one very odd, though trifling Circumſtance. The Name of the Perſon, who owns the Land where thoſe Caves are, is *Pachieco*, which is very near the ſame with that of the *Spaniard*, who is ſaid by *Plutarch* to have entertained *Craſſus* ſo courteouſly, Πακιακὸς. *Hirtius*, in the Beginning of his Book *de Bello Hiſpanico*, mentions a *Spaniard* of Note in *Provinciâ Bæticâ*, called *Pateicus*. *Quibus præfecit hominem ejus provinciæ notum & non parum ſcientem, L. Julium Patiecum*, which was probably the *Roman* Name; and therefore I am ſurprized the *Latin* Tranſlator of *Plutarch* makes it *Pacianus*.

Moſt of the antient Geographers deſcribe the Coaſt Weſtward of *Carteia* in the following manner. *Julia Traducta, Mellaria, Bælo fluvius & oppidum, Portus Bæſippo, Promontorium Junonis*, &c. The Itinerary of *Antoninus*

Julia Traducta.

almoſt off this Place that runs pretty far into the Sea, on which a *Hamburgher* was loſt ſome Years ago. Perhaps *Mellaria* ſtood hereabouts.

Wherever it was, the Ruins of it muſt be a conſiderable way in the Sea, if Credit is to be given to *Pliny*, who, upon the Teſtimony of one born there, reckons only five Miles from thence to *Afric*. Lib. iii. whereas it is at preſent five Leagues over at the narrow Part. *Caſaubon* is miſtaken in that Note on *Strabo*, *Lib*. ii. where he ſays, *At Maris Mediterranei oſtium vix LXX Stadia latum eſt* ᾗ στενώτατον.

I cannot help obſerving that the beſt Honey in all *Spain* is made in theſe Parts, and that the ſame Cauſe, to which the ancient *Mellaria* ow'd its Name, ſtill ſubſiſts, and has given a modern Appellation to ſeveral Places hereabouts, as *Playa de Orimel*, *Rio de la Miel*, *Bejer de la Miel*. The latter of theſe is generally reckon'd by the *Spaniards* to be the old *Mellaria*, for no other reaſon that I can ſee, but the Name. For it is at leaſt two Leagues from the Coaſt of the *Streights*, and, by what I could judge when I was on the Spot, as near the Ocean; and therefore may as well be aſcribed to the one as the other. Whereas *Mellaria*, according to the old Geographers, was ſituated on the Sea-ſide in the *Streights*, and is reckon'd by *Pliny* the neareſt Town to *Afric*; a plain Proof that it was not what is now *Bejer de la Miel*.

About a League and a half further Weſt, in a ſmall Bay, there are very great Ruins, which appear evidently to be the Remains of a *Roman* Town. A League Eaſtward from that Place, upon an Eminence, are to be ſeen the Quarries from which the Stone was fetch'd for building it; and all the Way from thence are large Remains of an Aqueduct, of which, in ſome Places there are entire Arches ſtill ſtanding. Among the Ruins of the old Town, I ſaw the Body of a *Roman* Statue of fine Alabaſter, ſomething bigger than the Life. Our Guide ſaid his Father had ſeen it entire; but as it was an Idol of the *Gentiles*, they like good Catholicks, had broken it to pieces. He likewiſe told us that Urns of old Coins had been found there; but not being current in *Spain*, they had thrown them away. The Place is called *Balonia*. It is over-againſt *Tangier*, and frequently infeſted by the *Moors* from thence; on which account it is uninhabited. A ſmall River, call'd *Alpariate*, runs by it; all which Circumſtances correſpond with the ancient Accounts of *Bælo*. I have a Medal was given me at *Tarifa*, with the following Letters upon it, BAILO, which probably belonged to this City, called by *Ptolemy* Βαίλων. *Martianus Capella*, *Lib*. vi. mentions it under the Name of *Velonenſis Bæticæ Civitas*. The Itinerary of *Antoninus* places *Bælo* VI. M. P. Weſt of *Mellaria*, which is about the Diſtance of theſe Ruins from *Val de Vaca*.

About five Leagues farther is the Cape of *Trafalgar*; the Sight of which immediately brought to my Mind *Mela*'s Deſcription of it. *Illud jam in Occidentem & Oceanum obliquo jugo excurrens, atque ei, quod Ampeluſium eſſe dixeramus, adverſum*, &c. Near the Cape's Point are the Ruins often mention'd by the *Spaniſh* Authors, under the Name of

Aguas

Aguàs de Mecca. I was not there, but was aſſured at *Bejer de la Miel*, that there were ſtill ſome Ruins on the Shore, and more in the Sea, that run all along under the Cape; particular Remains of a Mole, which muſt have made it a tolerable Harbour. Theſe Ruins ſeem to be the Remains of old *Bæſippo*. *Plin.* Lib. iii. *Portus Bæſippo.* Mela; *Bæſippo uſque ad Junonis Promontorium oram freti occupat.*

The placing of Watch-Towers along the Coaſt of *Spain* to alarm the Country, upon any Deſcent, ſeems to have been a Practice of a long ſtanding, *Livy*, Lib. xxii. cap. 19. *Multas & locis altis poſitas turres* Hiſpania *habet, quibus & ſpeculis & propugnaculis contra latrones utuntur: inde primo, conſpectis hoſtium navibus, datum ſignum* Aſdrubali *eſt*, &c.

Urns *and* Sepulchral *Monuments in* Ireland, *by Mr.* F. Neville, *n.* 337. *p.* 252.

XXIV. At *Caſtle-doe* in *Ireland* I was told of an Urn that was found within a Mile of that Place. That Man that had found it carried me into a little Iſland, ſurrounded with Bog, where his Cabin ſtood: The Iſland was very dry, light, ſandy Ground, which he had plowed. The Plow running in ſome Places over flat Stones, cover'd above with Earth, made the Man curious to ſearch. In taking up the Stone he found a Cavity under it, which I believe may be called a Sepulcher, or Tomb: In it he found an Urn, which he broke, becauſe nothing was in it but Bones and Aſhes. In the ſame Tomb there were ſome Bones of one about ten or twelve Years old. The Tomb ſtood E. and W. the Urn was found in the Weſt-End; it was the ſmalleſt Urn I have ſeen, but the Cavity wherein it lay was near five Foot long, two Foot and a half broad, and about the ſame Depth: It was made up of ſix coarſe flag Stones, *viz.* one on each Side, one at the Head, another at the Foot, one above and one below: The Bones were much waſted, and but few of them. Whilſt I ſtaid there we open'd three more, which the Man quickly found out, becauſe he had made his Marks by the Plow. Theſe three were much larger than the former; one of the three was near the Center of the Iſland, and biggeſt of all, but all alike made. There was no Urn in either of them, and but Bones in one, which was the biggeſt. The Bones ſeem'd to be of a Man of an ordinary Stature: If there had been any in the other two, they were conſumed. This ſeem'd to be a common Burying-place, there being ſo many of that kind of Tombs in it; and one may gather from thence, that at that time they burnt ſome, and others they did not, becauſe there was an Urn found with Bones burnt, and there were Bones unburnt. This Iſland is ſituate on an *Iſthmus* about half a Mile over, btween the Bay of *Dunfannaghan* and the Logh of *Kinnevier.*

There were three the like Urns found in three ſmall Stone Cheſts, under a geat Kern, or Heap of Stones, near to *Ban*-Bridge in the County of *Downe*; which Heap being removed to help to build that Bridge, they were diſcover'd.

There were the like Urns found near *Omagh* in the County of *Tyronne*; in the like Cheſts, under two Heaps of Stones, which were removed to build ſome Houſes in the ſaid Town.

There was one Urn found in a little ſandy Hill near *Cookſton*, on the Road to *Liſſon*, in the County of *Tyrone*: It was covered with a great rude Lime-Stone; which being removed in order to make Lime, the Urn was diſcover'd in a Hole encompaſs'd with ſix Stones of equal Bigneſs, which made a Hexagon, in which the Urn ſtood. The Water that had fallen on the Urn from the Lime-Stone, or the Air condenſing, had petrified, and made a ſtony Cruſt on the outſide thereof. There were ſome Bones and Aſhes found in it.

At *Dungannon*, in the ſame County, a Servant of mine working in a Sand-Pit near the Town, ſtruck on an Urn, which was the largeſt I ever ſaw. It was found with the Mouth whelm'd downward, the Bones and Aſhes on a flat Stone, and the Urn covering them: It would have held about three Quarts, and had been better burnt in the Fire than they uſually are: It was broke by the Spade before the Man was aware, and had no Stones about it as the others, but was buried in the Earth about a Foot under Ground. As they dug the Bank for Sand, the Place where the Carcaſs was burnt was diſcover'd by the Coals and pieces of Bones, which ſpread a great way, about a Foot under Ground.

Near to the ſame Town in a Town-land call'd *Killimeille*, (which in *Engliſh* is *Louſey* Cell, or *Louſey* Burying-place,) there are on the Top of the Hill two Circles of dry Stone about twenty Yards in Diameter each; they meet on two ſides, and make the Figure of Eight. I ſuppoſe, when firſt form'd they made a dry Wall for two diſtinct Burying-places, one for the Men, the other for the Women, or rather two Repoſitories for Urns. One *James Hamilton*, wanting Stones to build a Houſe, drew off moſt of them from this Place. When he had enter'd within one of the Circles, he found three Urns in three ſeveral Holes, ſet about with ſix Stones, and cover'd with flat Stones, and other Stones thrown on the Top; he broke what he found, not finding what he expected. Mr. *Knox* and I went there to ſee the Place, and ſaw the Holes and broken Urns; but the Man's Houſe being finiſh'd, there were no more found; but I am perſuaded there are many more, becauſe theſe three were found near together.

On the ſame Hill, about thirty Yards diſtance to the Eaſtward of theſe Circles, upon ſearch we found the Altar whereon they uſed to burn their Dead, overgrown with Earth and green Sod, which we cauſed to be uncovered: It was made of dry Stone, eight Foot long, and four broad, the Coals and Bones freſh among the Stones, and the Stones burnt with Fire. At the Eaſt-End of this Altar there was a Pit, which was likewiſe over-grown with Earth and green Sod; which we open'd, and found it to be the Receiver, where they ſwept in all that remain'd on the Altar after burning. We ſearch'd deep, and the Subſtance was all alike, black and greaſy: It had tinged the Hill in a ſtrait Line from the Pit to the Bottom of the Hill, and diſcover'd itſelf to our View, the Land being then plough'd.

I ſhall add only one more that I have ſeen, beſides the many that are yearly diſcover'd, to ſhew that this was the Way the *Iriſh* had for burying in Heathen Time, though the People know nothing of it by Hiſtory or Tradition.

In the County of *Farmanagh*, upon a Hill over *Wattle*-Bridge, there has been a mighty Heap of Stones, the Baſis incircled with very large Stones ſtanding on end. This Heap has been removed to pave our Ways, and build that Bridge; under which there were ſome Urns found in Stone Coffins, and I believe there are ſome remaining. Theſe were, I ſuppoſe, the Urns of ſome great Perſonages. The Heap was ſo big, and the Stones about it ſo large and ſo many, that it coſt great Pains to bring them there: Or perhaps there might have been a Fight there, and ſome of the great Officers might have their Bones interr'd there, and the Army made that great Work over them; for it ſeem'd to be a Work done by many. I have ſeen ſeveral ſuch Heaps in this Kingdom, and I doubt not but they are all Monuments for the Dead.

—Urns *found in* Norfolk, *communicated by Mr.* P. le Neve. *n.* 337. *p.* 257.

XXV. About half a Mile from *Elmham*, in a Cloſe called the *Broom-Cloſe*, ſome Labourers were repairing the Fence on the South-ſide of the Cloſe, and in the Bottom of the Ditch accidentally pitch'd upon a Pot, which they expected to have been full of Money; but finding nothing but Duſt and Aſhes, went to their Work again, and digging on, found two or three more, but the Contents the ſame. The Report of this put ſome Perſons of more Curioſity upon a further Search: And digging firſt under the Hedge, afterward further into the Cloſe, found great Quantites of them, and ſeveral very near together. One Man, who has been chiefly employ'd in this Search, has taken up, ſince the firſt Diſcovery, almoſt 120, and yet the Compaſs of Ground turn'd up on this Occaſion does not amount to more than a Rood of Land, (*i. e.* one Quarter of an Acre.) The Cloſe where they are found is high Land, and this Place the higheſt Part of it; the Soil a ſharp Gravel, and very dry, and lies next to a Highway. As for the Urns themſelves, they are generally of the ſame Shape, but of very different Sizes.

The Shape of theſe is conformable to the Repreſentations uſually exhibited in the Deſcriptions of Urns, *viz.* the Bottom narrow, a little flatted (and in ſome quite round) wider upward; the Top contracted to a narrow Mouth; the Earth coarſe, the Work rough and uneven, but generally well burnt; ſome of them ſlightly wrought and indented (the Work expreſſes very little Skill or Care) and ſome plain, of which laſt Sort I have one perfectly entire (not yet open'd.)

The Size is various, ſome of the Capacity of a Quart, ſome two, ſome three Quarts, and one I have (unopen'd yet) that I believe will contain a Gallon.

The Pots are very tender when they come firſt out of the Ground, and frequently ſuffer by the Spade: They are moſt of them broken (more or leſs) in the taking of them up, and hardly any that have not a *thin Edge* to one and a half or two *Inches* at the *thicker End*, where they are *hollowed* to put upon a *Shaft*. Each of them has an *Ear* or *Loop*. From his Relation, 'tis plain that they are juſt like that we have in the *Repoſitory* adjoining to the *Bodleian* Library at *Oxford*. This has been kept there for ſeveral *Years*; but where 'twas diſcover'd, there is not the leaſt *Memorial* to inform us. Perhaps it might be procured by Dr. *Plot*, when he was writing the *Natural Hiſtory of Staffordſhire*, where he has (*a*) mention'd ſeveral *Inſtruments* of the ſame kind dug up in that *County*. It is Mr. *Thoreſby*'s Opinion that theſe *Inſtruments* were the *Heads* of *Spears* or *Walking-Staves* of the *civiliz'd Britons*, and for *Confirmation* of it, refers to Mr. *Speed*'s *Hiſtory of Great Britain* (*b*), where he has publiſh'd the *Figures* of the *ancient Britons* both before and after they were *civilized*. He acknowledges, however, that the *Tops* of the *Spears* there, are *ſomewhat different* from thoſe we are now conſidering. And indeed they are not only *ſomewhat*, but *altogether different*, being exactly of the ſame *Make* with thoſe we find in the *Columna Trajana*, and the Books that repreſent to us the *Military Inſtruments* of the *old Romans*, *Greeks*, &c. But had they been of ſome *Reſemblance*, yet I cannot ſee that thoſe *Figures* in *Speed* are of any *Authority*. For tho' he gueſſes that they were copied from *old MSS.* yet I could never yet meet with any *MSS.* of our *Britiſh Hiſtory* that have any ſuch *Figures*. If ever any one had them, we have reaſon to preſume that other *Books* upon the ſame *Subject* would have retain'd them, at leaſt we ought not to doubt it of *Copies* of the ſame *Author*. That is the *Method* obſerved in other ſorts of *MSS.* The *Illuminators* were generally left at liberty as to the *Ornamental* Parts of the *Great Letters*; but when any *Figures* were to be *depicted* that ſhould illuſtrate and explain the *Author*, there they were to be *exact* and *punctual*, and they had no more Allowance to *alter* them, than they had to *alter* and *interpolate* the *Text* of the *Author* himſelf. Hence I am inclined to think that theſe *Figures* are *Modern*, and are owing to Mr. *Speed* himſelf. 'Tis alſo what himſelf inſinuates in the ſame *Chapter*, acknowledging that they were adapted to the *Deſcriptions* given of the *Britons* in *ancient Authentick Authors*. But not to examine other *Particulars*, the *Form* of the *Spears* in their Hands is not countenanced by any *Authority* of Note. For tho' *Herodian* has acquainted us, that they uſed *ſhort Spears*, yet he is ſilent as to the *Make* of them. Nor indeed have we any where a good Account of the *Military Arms* of the *Britons*. The *Authors* tranſmitted to *Poſterity* by them are Modern in compariſon of the *Roman Writers*, and are withal *Romantick*, and not to be rely'd on. And as for the *Bards*, they took no Care to tranſmit to *Poſterity* theſe *Weapons*, or to give us *nice Relations* of their *Countrymen*. 'Tis true, there have been,

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(*a*) See Chap. X. Sect. 19, &c.

(*b*) *L.* 1. *c.* 7.

been, and are ſtill found ſeveral *Inſtruments* made of *Flint*, which the beſt Judges eſteem to be *Britiſh*. The *Flint Heads* of their *Arrows* are commonly called in *Scotland Elf-Arrows*, as being ſuppoſed to have an *extraordinary Virtue* againſt the *Elves*, and to drop from the Clouds. There are other *Flints* ſomewhat in Form of *Axes*, and theſe Dr. *Plot* calls (*c*) *Britiſh Axes*; but Dr. *Leigh* thinks (*d*) they are *Indian*. Sir *William Dugdale* inclines to the Opinion embrac'd by Dr. *Plot*, and he acquaints (*e*) us with ſeveral of about four Inches and a half in Length, curiouſly wrought by *grinding*. But they might as well have been *Roman*, the *Romans* having uſed *Flint Weapons* as well as the *Britons*; and 'twas from the *Romans* that the *Britons* learnt the Art of working them. That which alſo ſeems to make us believe that they might be *Roman*, is, that thoſe mention'd by Sir *William* were found at *Oldbury*, *Aldbury*, or *Ealbury*, which was a *Roman* Fort, and is the ſame in Signification with *Alcheſter* in *Oxfordſhire*; *Alcheſter* being nothing elſe but Ealꝺ-ceaꞅꞇeꞃ, ſo call'd by the *Saxons*, to ſhew that 'twas a *Place* of *Antiquity* even in their Time. And tho' the *Anonymous Author* of the *Antiquities* of *Alcheſter*, at the End of the *Parochial Antiquities* of *Ambroſden*, derive it from *Allectus*, as if he were the *Founder*; yet there is no *Authority* either from *Coins*, *Inſcriptions*, or *Books*, to countenance the *Conjecture*.

Now ſince there are no *Authentic Authors* by which we may learn what Arms were made uſe of by the *Britons* in their Wars, I can think of no properer Method for finding this out, than by ſeeing what Arms were in uſe among thoſe People from whom they *immediately* had their *Original*. Mr. *Sheringham* inclines to the Story of *Geoffrey* of *Monmouth*, who deduces the *Britons* from the *Trojans*. And this is the Opinion too of ſeveral other learned Men. But whatever their *Abilities* and *Authority* might be in other reſpects, yet in this they muſt be reckon'd *partial*; and I rather ſtrike in with thoſe other *Writers* of more *Authority*, who derive the *Britons* from the *Gauls*; amongſt whom Mr. *Cambden* is chief. He has *diligently* and *nicely* prov'd that the *Gauls* and *Britons* had the ſame *Religion*; that they *both* had their *Bards* and *Druids*, enjoy'd the ſame *Form* of *Government*, uſed the ſame *Method* of *Fighting*, had the ſame *natural Genius*, were equally *candid* and *innocent*, were addicted to *change* when provok'd, were *compaſſionate* to their *Relations*, and always ready to partake in their *Vindication*. He has withal ſhew'd that they *both* affected *great Numbers* of *Servants*, that their *Buildings* were alike, and were ſurrounded with *Woods*, that they *both* uſually wore *Chains* of *Gold* about their *Necks*, and had *Rings* on their *Middle-fingers*; that they *both* wore *long Hair*, and that the *Garments* call'd *Brachæ* were *common* to *each*. Theſe things he confirms from

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(*c*) Loco ſupra citat.

(*d*) *Natural Hiſtory of* Lancaſhire; *lib.* 1. *p.* 181.

(*e*) *Antiquities of* Warwickſhire, *p.* 778.

from the *beſt* and *moſt approved Authors.* And as the *chiefeſt Argument*, he has alledg'd Variety of *Inſtances* to ſhew that they ſpoke the ſame *Language.* Mr. *Sheringham* was aware of this; and therefore to evade the *Force* of the *Argument*, he makes (*f*) the *Trojans* to come through *Gaul*, which being then thinly inhabited, he ſays *Brute* and his *Companions* ſoon conquer'd it, built a City, and continued there 'till ſuch time as they had well peopled it; after which they paſs'd over into *Britain*, and by that means the *Britons* came to have the ſame *Language*. This does not ſeem conſiſtent with the uſual *Prudence*, nor with the other *wiſe Acts* that are aſcrib'd to *Brute*. For no one that *rightly* conſiders, can think that *Brute* would voluntarily leave ſo *large* a *Country* as *Gaul* for one that was ſo much *leſs.* It is therefore more likely that the *Britons* had their *immediate Original* from the *Gauls*. *Cæſar* himſelf thought ſo as to thoſe that inhabited more near the Coaſts, notwithſtanding his Obſervation that the *Midland People* were *Aborigines*. Nor will *Boxhorn*'s Aſſertion, that the *Gallick Tongue* was the ſame with the *Scythian*, overthrow this Hypotheſis. For it may very well be ſuppoſed that the *Gauls* came firſt from the *Scythians*, who are in *Juſtin* (*g*) obſerv'd to have been the moſt *ancient People*, and to have contended with the *Egyptians* on that *ſcore*. This will exactly agree with what *Cambden* and others have aſſerted concerning the *Gauls* being deſcended from *Gomer*, the eldeſt Son of *Japhet*. I know that Mr. *Sammes* derives the *Scythians* from *Magog* the ſecond Son of *Japhet*. But (not here to take notice of his contradicting himſelf in this Point) ſince *Strabo* (*h*) and *Stephanus* (*i*) mention a City call'd *Gogarena*, between *Colchis* and *Iberia*; and ſince the City *Hierapolis* in *Cœlo-Syria*, according to *Pliny* (*k*), was call'd by the *Syrians MAGOG*; 'tis more probable that *Magog* ſeated himſelf in thoſe Countries, near to which 'tis agreed his Brethren ſettled, than that he wander'd ſo far out of the way from them. Here I cannot but take notice that the *Britons* were like the *Scythians*, a *frugal People*, and their *long Lives* (they often living to the Age of 120 Years) might in great meaſure be aſcrib'd to their *Temperance*, and their *Milk-Diet*, (juſt like the *Hippomolgs* mention'd by *Homer* (*l*). And as *Æſchylus* tells us that the *Scythians* were **ἱππάκης βρωτῆρες εὔνομοι**, *a juſt Nation, and addicted to the feeding of Horſes*; ſo the ſame may be ſaid of our ancient *Britons*, who were very religious, and obſerv'd the Rules of their Prieſts, and took extraordinary Delight in *Cattle*, whence perhaps they might affect to have the Figures of Beaſts cut upon their Bodies. From what has been laid down, I hope 'tis plain that the *Gauls* and *Britons* were of the ſame *Original.* The next Enquiry is what *Arms* were uſed by the *Gauls*. There are ſeveral

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(*f*) *See his Book* de Origine Gentis Anglor. *p.* 7, & ſeq.

(*g*) Hiſt. *lib.* ii. *c.* i. (*h*) *Lib.* ii. (*i*) ***De Urbib. voc.* Γωγαρήνη.**

(*k*) Nat. Hiſt. *lib.* v. *c.* 23. (*l*) Il. xiii. *v.* 5.

ral Authors that have written of the Nature of them, and particularly *Cluver* and *Boxhorn*. Their Names are *Spatha*, *geſſum*, (*geſum* or *gæſum*) *lancea*, *ſparum*; *cateia*, *mataris*, or rather *materis*, (not *matara*) *machæra*, *μάεις*, *μαΐεις*, *μάδεις* or *μάαεις*, (*m*) *thyreos*, and *cetrum* or *cetra*. I ſhall not here inſiſt upon the Signification or Reaſon of the Names; but only obſerve in general, that the *geſſum* was a *Javelin*, the *ſparum*, *cateia*, and *mataris* were different ſorts of *Darts*, and that the *thyreos* was an *oblong*, and the *cetrum* a *ſhort* ſort of *Shield*. So that the *Spatha* only remains (for the Nature of the *Lance* is well known) to be compar'd with the Weapons we are conſidering. 'Tis call'd by the *Italians SPADA*, and by the *Spaniards ESPADA*. From the Deſcription that *Iſidore* has left us of it, we are inform'd that 'twas a *two-edg'd Sword*, with which they *cut*, and did not *thruſt*. Whence 'tis plain theſe Arms had not *ſharp Tops*, agreeable to what *Livy* (*n*) has related, that their *Gladij* were *prælongi, ac ſine Mucronibus*. And *Polybius* has the ſame Reaſon why they did not *puſh* with them. Hence it is clear that our *Inſtruments* which have not *two Edges*, but are *dull* like *Wedges*, were not *Spathæ*; and ſince they do not agree to any of the other *Gallick Inſtruments*, we muſt examine whether they agree with any of the Arms of ſome other *ancient Nation* that made a *Figure* in *Britain*.

Our Anceſtors the *Saxons* will have no Share in this Enquiry. For 'tis plain from the Hiſtory of them given by *Verſtegan*, and the Figures publiſh'd alſo by him, that *Spears*, *Halberds*, *Shields*, *Croſs-bows*, *Swords*, (which were *broad* and *bowing*, ſomewhat in faſhion of a *Scythe*) and *Hatchets*, which they call'd *Bills*, were the Arms made uſe of by them; nor did the Weapons of the *Danes* that ſucceeded them much vary, if at all. Coming from the *ſame Parts*, they uſed the *ſame Cuſtoms* in their *Military Undertakings*. For tho' the *Normans* endeavour'd to make an *entire Alteration*, yet they found the Attempt impracticable, and they were forc'd to acquieſce, and lay aſide their Propoſals, which thwarted ſo very much thoſe ancient Cuſtoms that were here generally entertain'd and receiv'd. But however, notwithſtanding theſe Inſtruments do not reſemble either the *Saxon* or *Daniſh Military Arms*, yet I find in *Worminus*'s *Muſeum* (*o*) two *Cimbric* Inſtruments with which they have ſome Likeneſs. Theſe he tells us were of *Braſs*, and he calls them *Wedges*. The larger of them was five Inches in Length, and three in Breadth. He is of Opinion that they were uſed in the Wars, eſpecially when the Armies were very near each other. If they had Holes by which they might have been fix'd to *Helves*, he would have believ'd them to be *Battle-Axes*; but being neither *hollow* (as ours are) nor having no other way of being faſten'd to other Inſtruments, he concluded that the Name of *Wedges* might be moſt proper. An ingenious Gentleman ſome time ſince

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(*m*) *See* Livy, *l.* viii. *c.* 24. *Edit.* Oxon.

(*n*) *Lib.* xxii. *c.* 46. *Edit.* Oxon.

(*o*) Page 354.

ſince inform'd me, that much ſuch Inſtruments had been found in the *Iſle of Man*, and that a great many Urns had been alſo diſcover'd there, as likewiſe divers Inſcriptions with ſtrange Characters. I do not queſtion but the Inſcriptions are *Runick*. And 'tis highly probable that the Inſtruments were like thoſe in *Wormius*; but if they agree exactly with ours, they will, from what I ſhall ſay by and by, appear to be *Roman*. For notwithſtanding it be commonly held that the *Romans* never were in this *Iſle*, yet I ſee no other reaſon why it ſhould be thought ſo, than that the *ancient Authors* now remaining do not mention it. This is only a *negative Argument*, and what we ought not to lay a very great Streſs upon. The Urns ſeem clearly to evince that they were here. I know indeed that 'tis ſaid that theſe Urns muſt be perfectly *Daniſh*, by reaſon of the *ſmall black Bones* and *Aſhes* found in them; which however is no ſure Ground to go upon. For I have ſeen in the *Bodleian Repoſitory* a Piece of a *Roman* Urn, which was dug up ſeveral Years ago at an old *Roman* Town in *England*, with many others, ſome of which were of different Figures. 'Tis now in a Box, and with it are *little black Bones*, *Aſhes*, &c. wrapt up in two Pieces of coarſe Linnen. This Linnen is in the ſame Figure with the Urn, but the Urn for one of the Pieces is wanting. The Smallneſs of the Bones ſhews that they are the Relicks of Children. It was cuſtomary among the *Romans*, after the Bodies were burnt, to waſh the Bones with Wine and Milk, and afterwards the Women wrapt their Children in Linnen, dry'd them in their Boſoms, and then put them into Urns to be buried: This Cuſtom was alſo peculiar to the *Danes*, who learnt it from the *Romans*, from whom likewiſe they receiv'd *Urn-Burial* itſelf. Such Urns too are mention'd by Sir *Thomas Brown* to have been found at *Old Walſingham* in *Yorkſhire*. Nor is the *Roman* Hiſtory altogether ſilent of the *Iſle of Man*'s being known to the *Romans*. For *Plutarch* expreſsly tells us, that one *Demetrius* ſailed hither, as well as to other *Britiſh Iſles*, in the Reign of *Adrian*. 'Tis no wonder that *Runick Inſcriptions* are diſcovered in the Places where *Roman* Urns are found. Thoſe Inſcriptions might have been made upon other Occaſions, after it became in future Ages inhabited by *Danes* and *Norwegians*. The ſame Accident has ſometimes happen'd in *England*. And Mr. *Cambden* particularly relates in the Cloſe of his Diſcourſe concerning *Stone-henge*. that in the Time of King *Henry* VIII. was found at *Stone-henge* a Table of mix'd Metal, on which were engrav'd many Letters; but the Character was ſo ſtrange, that neither Sir *Thomas Elyot*, nor Mr. *Lilly*, the School Maſter of St. *Paul*'s, could tell what to make of them, and ſo there was no Care taken to preſerve the *Monument*; the Loſs of which was afterwards much lamented by *Olaus Wormius*, who thought it to be *Runick*, as without queſtion it was; and yet *Stone-henge* itſelf is a *Roman* Work.

Having ſhew'd that theſe *Inſtruments* were not *military Arms*, either of the *Britons*, or of the *Saxons*, or of the *Danes*, I ſhall now endeavour to prove that they are owing to the *Romans*. I once thought that they were a ſort of Axes which the *Romans* made uſe of in their Sacrifices, of which Dr. *Plot* takes notice of two ſorts, the *Secures Lapideæ*, and the *Secures Cupreæ*, though Dr. *Leigh* will have his Inſtances to be both *Indian*. Upon a more narrow Conſideration of the *Roman* ſacrificing Inſtruments, I have quite changed this Opinion, not finding the leaſt Footſteps of ſuch *Axes* in any of the Books of *Roman* Antiquities I have hitherto conſulted. On the contrary, they are in the *Suovetaurilia* or *Solitaurilia* of the *Columna Trajana* repreſented in the ſame Form, and faſtened in the ſame Manner, that we uſe at this Day. And ſo alſo in other Sacrifices, as may partly be ſeen in the Gems, Rings, &c. publiſhed out of the Studies of *Auguſtinus* and *Gorlæus*, as well as in the Monuments of *Gruter*, *Reineſius*, *Spon* and *Fabretti*, to omit the Authors collected upon this Subject by *Grævius* in his large Body of *Roman* Antiquities. Neither could they have been the Heads of Spears, as is manifeſt from the ſame Authorities. The *Roman* Spears and Javelins occur very frequently, and yet not one of them either on their Coins, or elſewhere, is to be met with in the Figure of theſe Inſtruments. It is true, ſome of their Spears had two Heads; ſo they might uſe either End uppermoſt, as they pleaſed. We have one of theſe in *Auguſtinus* (p). The Heads differ from one another, but they neither of them anſwer our Monuments. Nor are the moſt ancient Spears of the *Romans* we meet with, different from thoſe they made uſe of in more modern Times, as may in ſome meaſure be ſeen in the *famous Shield* lately publiſhed at *Oxford* (q), which is certainly authentick. It may here be farther added to what is there alledged, that *Lucius Florus* gives (r) us the firſt Inſtance of the *Romans* fighting upon Horſes without Bridles; and in the *Columna Trajana* (s) the Horſes are placed in full Speed with their Riders, without any Bridles, or other Curbs to reſtrain or guide them; a great many of the *Romans* having made themſelves Maſters of this Method of Fighting, that they might, like the *Numidians* (who were famous for it) be the leſs incumbered in the Battle, and ruſh upon the Enemy with the more Force. Their *Deſultores* alſo are Proof enough of its being practicable.

But now though theſe Inſtruments are not properly *Roman* military Weapons, ſuch as they uſed in their Battles; yet they were of ſervice amongſt the Soldiers, and good Numbers of them were conſtantly provided to be carried about in the Army. For I believe that they are *Roman Chiſſels*, and that they were uſed to cut the Stones, and other Materials that were judged ſerviceable for building their Camps. This is not Conjecture only, as appears from the *Columna Trajana*, where (t) the Soldiers are repreſented poliſhing the Stones for the *Roman* Tents in the *Dacic* Wars with ſuch ſort of Chiſſels made of Braſs.

(p) Gemm. & Sculpt. antiq. *ex Edit.* Jac. Gronovii, Franeq. 1694. *Part. num.* 155.

(q) *Vide* Livii *Edit.* Oxon. *Vol.* VI. *p.* 195. (r) *Lib.* I. *c.* 9. (s) *Num.* 199.

(t) *In Num.* 167.

Theſe Chiſſels they beat and worked into the Stone, and other Materials, with Mallets of the ſame Metal. We have other Inſtances of it in the ſame Pillar, which is one of the beſt Monuments we have by which to judge of the ſeveral Inſtruments made uſe of by them in their military Enterprizes. Theſe Chiſſels were of admirable Service in making their *Aggeres*, which conſiſted of *Earth*, *Stones*, and *Timber*. The Stones were ſometimes thrown together without any poliſhing; but that was more rarely, and it was looked upon as a better Security to have them worked that they might lie even. By this Account the Reaſon will be eaſily perceived why theſe Inſtruments are hollow, namely, to faſten Handles to them for more Convenience in driving them. If they had been Wedges, it would have been a great Inconvenience to have had them hollow. Beſides, the Wedges, by being drove into the Wood or Stones, would have been ſtrangely worn on the Sides, and have received conſiderable Alterations; whereas the Sides of ours in the *Bodleian Repoſitory* (and I ſuppoſe theſe are ſo too) are juſt as they were at firſt, and there is not the leaſt Change, unleſs it be on the Edge, which is very blunt and much broken, which I gueſs to have proceeded from the Stone. As for the Ears or Loops, it is probable they might be put on, that thereby the Handles might be fix'd the better; or perhaps they were deſigned for the Eaſe of the Soldiers, who in their Journeys might by this means faſten them to their Girdles. For I believe moſt, if not all the Soldiers, had ſuch Inſtruments, which they were obliged to make uſe of when Neceſſity required. I know that it is the Opinion of moſt, that there were a few particular Perſons always in the Army to whom theſe Works were committed, and that they were exempt from the Office of Soldiers, and that they were *Marmorarij*, *Quadratarij*, *Tignarij*, and *Structores*. Theſe may be called all by one Name *Fabri murarij*, though that is commonly reckoned only another Name for *Structores*. But this is a wrong Perſuaſion; and *Fabretti* has (*u*) well obſerved, that there are no *Fabri murarij*, as they are taken for Artiſts, diſtinct from Soldiers, on *Trajan*'s *Pillar*. This Obſervation he has made in Oppoſition to *Santi Bartoli*, who calls them expreſsly *Fabri murarij*. *Fabretti*'s Remark, as it is very juſt with reſpect to this ſort of *Artiſts*, ſo it muſt be noted that there were no other diſtinct *Artiſts* that were freed from the *Duties* of *Soldiers*. Even the *Artiſts* that had received liberal Education are to be comprehended in this Obſervation, I mean their *Phyſicians*; which is the Reaſon that in *Fabretti* we have (*w*) the Picture of a Phyſician fortified with a *Lorica* or *Coat* of *Mail*, and moving his Hands to a ſick Perſon that was his Patient. The *Lorica* ſhews he was one of the *better ſort* of *Soldiers* called *Evocati*, thoſe of the *inferior Order* being allowed only a *Pectoral* of *thin Braſs*. It withal points out to us that he was, after he had finiſhed theſe Offices to the

Sick,

(u) Syntagm. de Columna Trajana, p. 208.

(w) Loco cit. p. 217.

Sick, bound to betake himſelf to the other Offices of a *Soldier*. This was ſometimes intermitted; but in *Trajan*'s ſtrict Diſcipline it was always obſerv'd, he being reſolved to imitate and bring into Faſhion the Severity that had been made uſe of in the more *ancient Times*. For this Reaſon we ſee the Soldiers in this Pillar duly exerciſing and performing, when there was any Need, all the Offices of Tradeſmen, it being at this Time cuſtomary to liſt Tradeſmen amongſt the Soldiers for this Intent.

Beſides the Uſes theſe Inſtruments were put to in forming the *Roman* Camps, they were moreover employed in making and repairing the High-ways, which ſwallowed up a large Quantity of Stone, eſpecially in ſuch Places as were marſhy and fenny. The *Pomptin* Marſhes were vaſtly large; and yet at ſuch time as the Soldiers were too many to be uſed againſt the Enemy, a Motion was made that they ſhould be employed to drain them, which was ſo well approved, that the Senate immediately gave Orders for it; and the Soil was ſo rich and fertile, that great Numbers came and ſettled here, inſomuch that there were no leſs than thirty-three Towns built upon the Ground. The Waters however afterwards got Strength again, and it was in a manner wholly drown'd; which made *Julius Cæſar* entertain ſome Thoughts of draining them afreſh, and of carrying the *Appian Way* through them, whereas it had before went about them; but he fail'd in his Deſign, and it was left for the Emperor *Trajan*, who, after he had cleanſed the Fens, cauſed a Stone-Way to be made through them, whereon were built large Inns and magnificent Bridges for Conveyance of the Water which was in the upper Part of the *Marſh*. For Memory of which, he had a *Monumental Stone* erected with a proper Inſcription, by which it appears that the Way was 19 Miles in Length, there being placed at the End of every Mile a Mile-ſtone, and from thence the Way itſelf was in ſucceeding Times called *Decennovium*. I might from hence take occaſion to mention other Works of the *Romans* in *Italy* of this Kind, in which *Chiſſels* were abſolutely neceſſary for cutting the Stones; but at preſent I ſhall only remark, that as *Trajan* was diligent about the Ways in *Italy* and other Parts, ſo it ſeems he was no leſs careful of theſe Affairs in *Britain*. For notwithſtanding ſome tell us that the four Great Ways in *Britain* are owing to *Molmutius*, one of the *Britiſh* Kings, and *Belinus* his Son; yet Mr. *Cambden* and others have ſhewed that they are rather to be attributed to the *Romans*, being repaired and made as it were quite anew (whereas before they were very mean) by *Trajan*, after he had reduced the *Britons* to Obedience. Beſides which Ways he alſo made divers other leſſer ones here; and perhaps theſe *Chiſſels* may be ſome of thoſe uſed by the Soldiers in his Reign, though before his Time Acts of this kind had been performed by the *Roman* Soldiers, who alſo forced the *Britons* to undergo the ſame *Drudgery*, which occaſioned them to complain to *Agricola*, as if they were too ſeverely and hardly dealt with.

If it be aſked how it comes to paſs that theſe Inſtruments are of Braſs rather than of any other Metal? It may be replied, that they, as well as the People of other Nations in former Times, thought there was an extraordinary Virtue in Braſs. Whence it was, that they uſed braſs Inſtruments when the Moon was in an Eclipſe (*x*), thinking that by beating of them ſhe would the more eaſily be recover'd from her Labour; which Cuſtom almoſt univerſally prevailed. And it was upon Account of this peculiar Virtue ſuppoſed to be in Braſs, that the Inſtruments made uſe of in the ſacred Offices were in the more early Times all of Braſs, that the *Tuſcans* uſed Braſs Plow-ſhares when their Cities were built, and that the Prieſts of the *Sabins* were ſhaved with Braſs Razors (*y*.) *Heſiod* himſelf tells (*z*) us, that the Ancients uſed Braſs Inſtruments before Iron ones:

> Χαλκῷ δ' ἐργάζοντο· μέλας δ' οὐκ ἔσκε σίδηρος.

At which Time not only their Arms, but their Houſes were likewiſe of Braſs.

> Τοῖς δ' ἦν χάλκεα μὲν τεύχεα, χάλκεοι δέ τε οἶκοι. (*a*)

The Cuſtom might prevail as well in *Britain* as elſewhere, Iron being not ſo very plentiful in the firſt Time of the *Romans*, however it might increaſe afterwards when the *Bath-Forge* was erected, and all proper Methods uſed upon that Occaſion. Nor ought it to be wonder'd how the *Braſs-Chiſſels* could be applied to the Stone, without breaking to pieces immediately, any more than that the Plough-ſhares did not ſuffer the ſame Damage in caſting up the Ground, and grating againſt the Stones with more Violence. The Braſs in thoſe early Times was of a different Nature from ours, and ſo tempered as to endure much longer with leſs Inconvenience in the ſeveral Operations to which it was employed.

A Daniſh *Spur.*

As for another Piece of Antiquity, which Mr. *Thoreſby* ſpeaks of, namely, a Spur that is no leſs than ſix Inches and a half long from the Heel to the Middle of the Rowel, which he takes to be of a much later Date than the other Monuments, we have one in the *Bodleian Repoſitory* of much the ſame Length, of which I have made mention in my *Additions* (*b*) to Sir *John Spelman*'s Life of King *Ælfred*. There have been ſeveral others found in *England*, and Mr. *Thoreſby* has juſtly gueſſed his to be more modern than the other Inſtruments. For theſe Spurs are certainly *Daniſh*, as appears from *Wormius*'s *Monumenta Danica* (*c*), where he has given us the Figure of one, and there is an Account

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(*x*) *See* Liv. l. xxvi. c. 5. *Edit.* Oxon.

(*y*) *Vide* Rhodigini antiq. Lect. l. xix. c. 10.

(*z*) Ἐργ. ϗ Ἡμ. l. i. v. 150.

(*a*) Ibid. v. 149.

(*b*) Page 43.

(*c*) Page 50.

Account of divers others towards the latter End of his *Muſæum*, one of which is a Foot and ſome odd *Inches* in *Length*.

Ancient Trumpets, *&c. in* Ireland, *by Mr.* F. Nevile. n. 337. p. 250.

XXVII. Some ancient Trumpets were found in the County of *Tyrone* in *Ireland* about ſeven Years ſince: There were eight of them found together, four of one Make, and four of another; two of which are repreſented *Fig.* 56, and 57. they are of caſt Braſs, of the thickneſs of an *Engliſh* Half-Crown.

Fig. 55.

Figure 55, is 24 Inches long, according to the Turn or Arch it makes, and is three Inches in diameter at the large End; and at the ſmall End it is ſolid for about two Inches, with a Loop at the top to hang it by, and another Loop between the ſolid Part, and the Mouth-piece. The Mouth-piece is oval, five Inches from the ſolid End, one Inch and three quarters long, and one Inch wide: The Sides thereof are ſmooth, round, and even eaſy for the Lips of a Man, but will not admit of any Sound by Blaſt, as a Horn does, but by the articulate Voice of tooting it will: One may raiſe his Voice in it to the higheſt Pitch, and bring it the deepeſt Baſs.

Fig. 56.

Fig. 56, is 26 Inches long, one Inch wide at the ſmall End, and three Inches at the other; but ſeems to be imperfect for want of a Mouth-piece: The ſmall End ſeems to be fitted to receive one. On the Back at *a* there is a Hole, and another under the Moulding at *b*; the firſt I believe was to faſten the Mouth-piece, the ſecond I imagine was to ſtop or open with the Finger to alter the Sound at Pleaſure. But as it is now, it cannot be ſounded; for it is no way fitted for the Mouth, it being thin and ſharp.

I cannot find in any *Iriſh* Story, or by Tradition, any Account of this ſort of Trumpets, nor indeed of any other; from whence I gather they are of great Antiquity: For had they been of uſe at, or ſince the firſt of the *Engliſh* Conqueſts, there would have been ſome Hints of them. And therefore I conclude they were of uſe when the Country was *Pagan*, and not in Martial Affairs, but by their Prieſts at their Funeral Rites when they buried their Dead, and bore a Part with thoſe who cried at thoſe Funerals, or made an howling ſort of a Noiſe; which ſort of Noiſe is uſed among the Natives to this day.

Fig. 57.

Fig. 57, is an Inſtrument of much better Metal, being fine Gold; but what to call it, or of what uſe I never could meet with any could tell me. There have been five found in different Places, three of which I have ſeen. One was found near *Coothill*, in ſcowring a Ditch, under the ſide of a large Stone; which Stone was one of three which were placed triangular-wiſe; whether ſet in this Form as a Mark to find this Thing when hid, or whether for any other uſe, I cannot gueſs; but I have ſeen Stones in ſeveral Parts of this Kingdom ſet in this Order. It is reported, that there were ſome other Pieces of Gold found with this; but I could not ſee them.

One, I was told, was ſomewhat like a Scepter, about 18 Inches long; and another was round like a large Medal, as thick as two Crown Pieces, and as broad as the Palm of a Man's Hand, with ſtrange Characters on it. The Beauty and Colour of this, which I ſaw, ſurpaſſed any Gold I had ſeen: It had been caſt, and not wrought with the Hammer. The two Cones were two Inches in diameter each, and two Inches aſunder from each other. The Bow or Handle was made like an Arch, about a quarter of an Inch thick: The Handle was round, tapering towards both Ends, where it was fixed to both the Cones. The Goldſmith told me, that when he had wrought part thereof, he could not bring the Gold to the right Colour again, though it was in fineneſs equal to our Standard. This could be no Ornament for the Body; perhaps it might be of ſome religious uſe; but whether Popiſh or Pagan, I leave to better Judgments.

XXVIII. *Papers omitted.*

n. 306. p. 2230. 1. An Extract from Mr. *Baxter's Gloſſarium Antiquitatum Britannicarum* (ſince publiſh'd) concerning *Veraconium*, or *Wroneter*.

n. 337. p. 80. 2. De *Legionibus* Epiſtola, ad Virum Clariſſimum Doctiſſimumque *Hans Sloane*, M. D. Regiæ Societati à Secretis, Coll. Med. Lond. Sodalem, & Medicum Regium, data à *Guil. Muſgrave*, M. D.

n. 337. p. 145. 3. De *Aquilis Romanis* Excerpta ex Epiſtolâ *Guil. Muſgrave*, M. D. & utriuſque Societ. Reg. Socii, ad Virum Clariſſ. *Giſb. Cuperum*, Conſulem *Daventrienſem*.

n. 337. p. 157. 4. *Inſcriptio Tarraconenſis*: Cum Commentario *Guil. Muſgrave*, M.D. Coll. Med. & Societ. Reg. Lond. Socii.

XXIX. *Account of Books omitted.*

n. 300. p. 2012. 1. *Olaii Rudbeckii*, *Atlanticæ* ſive *Manhemii* Pars *Secunda*. In quâ Solis, Lunæ & Terræ Cultus deſcribitur, omniſque adeo Superſtitionis hujuſce Origo parti *Sueoniæ* Septentrionali, Terræ puta *Cimmeriorum* vindicatur, ex quâ deinceps in orbem reliquum divulgata eſt, *&c.* Accedunt Demonſtrationes certiſſimæ, quæ Septentrionales noſtros, in maxime genuinum Solis & Lunæ Motum, indeque pendentem accuratiſſimam Temporum rationem, multo & prius & felicius quam gentem aliam ullam penetraſſe declarant. *Upſalæ*. Folio.

n. 301. p. 2057. 2. *Olaii Rudbeckii Atlanticæ*, ſive *Manhemii* Pars *Tertia*. In quâ Vetuſtiſſima Majorum noſtrorum *Atlantidum* lapidibus, fago, æri, ſive cortici *Runas* ſuas incidendi ratio, una cum tempore, quo illa primo cœperit, exponitur. Necnon *Aurei Numeri* ſingulis Annis tributi, & Signorum Cœleſtium, quæ abhinc ad *Græcos* & *Latinos* ſunt tranſlata, vera Origo & Significatio traditur. Et illa à Diluvio *Noachi* primæ Ætates, atque in illis prima *Atlantidum* noſtrorum forma deſcribuntur;

quæ Migrationes & Bella ſub *Boreo*, ſeu *Saturno*, ejuſque filio *Thoro* ſeu *Jove* geſta ſunt, recenſentur: & denique *Scytharum*, *Phænicum*, & *Amazonum* his Ducibus in *Indo-Scythiam*, & *Phœniciam*, ſeu *Palæſtinam* è *Sueoniâ* factæ Expeditiones enarrantur. Quibus omnibus Mythologiæ perplures, quarum ſenſus in hunc uſque diem incognitus, hic demum detectus prodit, jucundæ ſane & perquam utiles adjunguntur. *Upſalæ*. Folio 1698.

3. *Edmundi Dickenſon*, M. D. *Phyſica Vetus* & *Vera*, ſive Tractatus de naturali veritate *Hexameri Moſaici*. Per quem probatur in Hiſtoria *Creationis* cum Generationis Univerſæ Methodum atque Modum, tum veræ Philoſophiæ Principia, ſtrictim atque breviter tradi. *Londini* 1702. 4*to*. *n.* 277. *p.* 1083.

4. A Letter from Mr. *William Baxter* to Dr. *Hans Sloane*, R. S. Secr. containing an Account of a *Book* entitled *n.* 311. *p.* 2438.

Archæologia Britannica, giving ſome Account, additional to what has hitherto been publiſhed of the Languages, Hiſtories and Cuſtoms of the original Inhabitants of *Great Britain*, from Collections and Obſervations in Travels through *Wales*, *Cornwall*, *Bas Bretagne*, *Ireland* and *Scotland*, by *Edward Lhuyd*, M. A. of *Jeſus College*, Keeper of the *Aſhmolean Muſæum* in *Oxford*. Vol. I. containing, 1. A Comparative Etymology, or Remarks on the Alteration of Languages. 2. A *Latin Celtic* Dictionary; or, a Vocabulary of the original Languages of *Britain* and *Ireland*. 3. An *Armoric* Grammar. 4. An *Armoric Engliſh* Vocabulary. 5. Some *Welſh* Words omitted in Dr. *Davies*'s Dictionary. 6. A *Corniſh* Grammar. 7. A Catalogue of *Britiſh* Manuſcripts. 8. An Eſſay towards a *Britiſh* Etymologicon. 9. A brief Introduction to the *Iriſh* or ancient *Scotiſh* Language. 10. An *Iriſh-Engliſh* Dictionary. *Oxford*. Printed at the *Theatre* for the Author, MDCCVII. *Folio*.

5. *Julii Vitalis Epitaphium*; cum Notis Criticis Explicationeque V. C. *Hen. Dodwelli*, & Commentario *Guil. Muſgrave*. *Iſcæ Dunmoniorum*. Sumptibus *Philippi Yeo*. MDCCXI. *n.* 337. *p.* 2831.

The Author of the *Commentary* (here) obſerves, that it is not repreſented aright by the Editor of the *Bibliotheque Choiſie*, Tom. XXV. *premiere partie*. For *pag.* 225, and 6, He ſays, [*Belges, qui des Provinces Septentrionales, du Continent des Gaules s'étoient tranſportez en Angleterre, autour de Bath & Wells:*] whereas the *Commentary* affirms no ſuch thing, and in all likelihood *Wells*, and perhaps *Bath* too, is much later than the ſettling of the *Belgæ* in *Britain*. In the ſecond place he obſerves, that whereas the *Bibliotheque* affirms of the *Bath* Fabric [*ce que l'on avoit ignoré juſqu'à preſent*] the *Commentary* quite otherwiſe ſays [*Fabricam* Aquis, *quod Orbi Literato jam diu latuit*, *fuiſſe* Calidis] pag. 189. Laſtly, ſpeaking of the round-bottom'd U, invented (as *Cellarius* affirms) about a hundred Years ago; this, ſays the *Bibliotheque*, is true, as to *Inſcriptions* [*Celà eſt vrai à l' egard des Inſcriptions.* [On the other hand had (the Doctor affirms) *quod hujus contrarium eſt veriſſimum*; there being now to be ſeen in *Cornwall* an old Inſcrition with a round U.

n. 346. p. 385. 6. *Guilbelmi Muſgrave* Reg. Societ. utriuſque Socii *Geta Britannicus*. Accedit Domus *Severianæ* Synopſis Chronologica: & de Icuncula quondam M. Regis *Ælfredi* Diſſertatio. 8*vo*. *Iſca Dunmoniorum*. MDCCXV.

n. 349. p. 502. 7. *Diſſertatio de Dea Salute*, in qui illius Symbola, Templa, Statuæ, Nummi, Inſcriptiones exhibentur, illuſtrantur. Auctore *Guilbelmo Muſgrave* G. F. è Coll. *Exon. Oxonii.* Typis *Leon. Litchfield*, Impenſis *Phil. Yeo*, Bibliopolæ *Exon.* MDCCXVI.

n. 344. p. 304. 8. *Ducatus Leodienſis*, or the *Topography* of the ancient Town and Pariſh of *Leeds*, and Parts adjacent, in the County of *York*, &c. by *Ralph Thoreſby*, Eſq; F. R. S. *London*. Folio 1715.

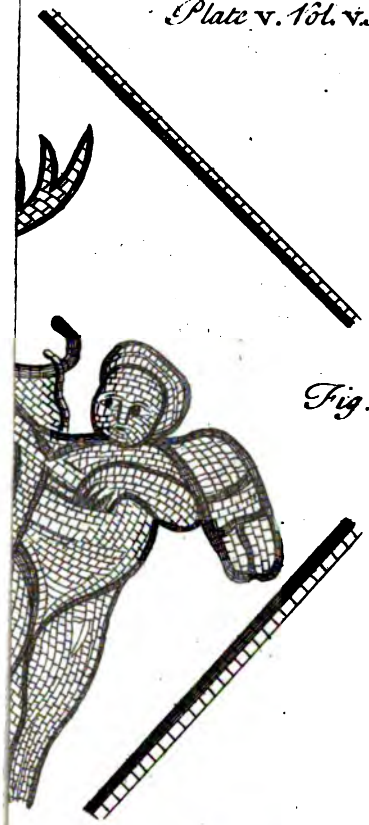
CHAP. III.

Travels. Voyages.

Obſervations in Natural Hiſtory *in* Shropſhire, *by Mr.* G. Plaxton. n. 310. p. 2418.

I. ANNO 1673, I was preſented to the Vicarage of *Sheriffe-Hales*, and alſo to the Rectory of *Kinnardſey*; the former in the Counties of *Salop* and *Staffordſhire*, the other wholly in *Shropſhire*. *Novemb.* 6. I was inducted into the Parſonage of *Kinnardſey*, where I was Incumbent for 30 Years and upwards. At my Induction I found a great many *aged People* in the Pariſh; upon which I took the Number of the Inhabitants, and found that *every ſixth Soul was ſixty Years of Age*, and upwards; ſome were 85, and ſome 90. This I could not but wonder at, conſidering that the Town was ſurrounded with a large Moraſs, overflowed in Winter, and that you could not come into the Pariſh any Way upon Arable-Land. At my Entrance there, I found neither *Gentleman* nor *Beggar*, nor any ſort of *Diſſenter* from the Church; there had been no *Law-Suit* amongſt them in the Memory of Man; nor was any commenced during my Incumbency as Rector there, for above thirty Years together. They have but *one Way to the Town and Pariſh*, the reſt they hire from Lords of the adjacent Manours. The *Moraſſes* or *Moors* are of a great Extent, and the Pariſh was ſurrounded with them; the Village was called *Kinnardſey* or *Kinnardus his Iſland*; *ei*, *ea*, *ey*, all theſe are watry Terminations. Thus the next Pariſh was *Eyton*, the Town upon the Waters; *Edney*, or *Edwyney*, *Edwin's* Iſland; *Buttery* or *Butterey*, the Iſland of Butter, being a long grazing Tract of Land; with ſome others of the like ending. All that vaſt Moraſs was called the *Weald-Moor*, or the Wild-Moor, that is, the Woody-Moor. Thus the *Wood-Lands* of *Kent* are called the *Weald* of

Plate V. Vol. V. Part II Page 112.



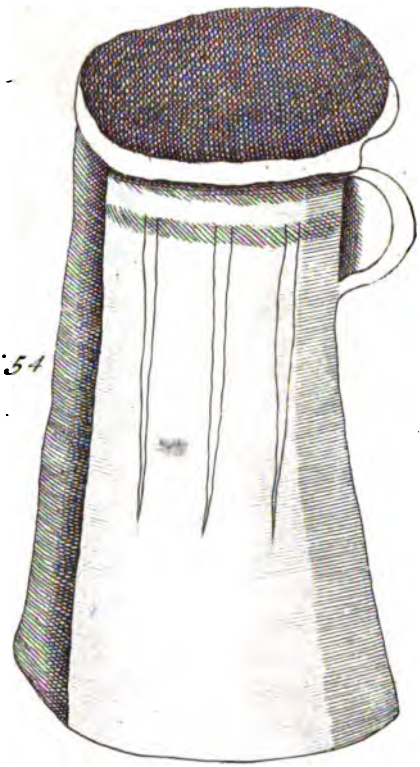
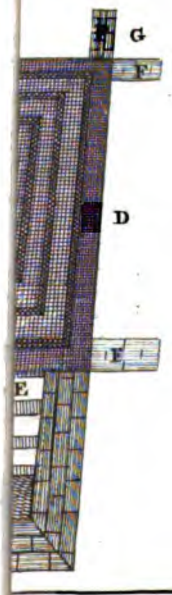


Fig: 54



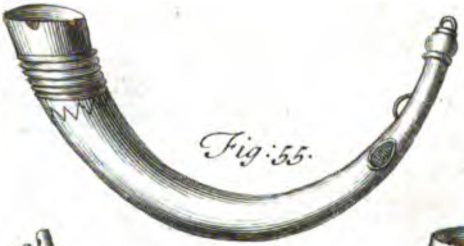


Fig: 55.

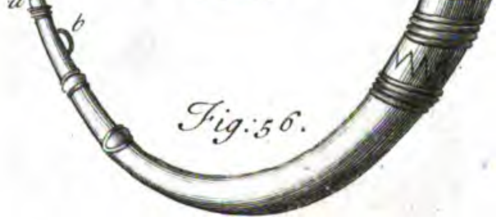
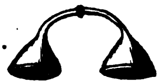


Fig: 56.

Fig: 57.


J. Harris Sculp.

of *Kent*; the *Wolds* of *Yorkſhire* moſt probably have been woody formerly, and called the *Wealds*; for the word *Weald* or *Wold* is by our *Saxon* Maſters rendered *Woody*; and I have been aſſured from aged People, that all the wild Moors were formerly ſo far overgrown by Rubbiſh Wood, ſuch as Alders, Willows, Salleys, Thorns, and the like, that the Inhabitants commonly hanged Bells about the Necks of their Cows, that they might the more eaſily find them. Theſe Moors ſeem to be nothing elſe but a Compoſition of ſuch Sludge and Refuſe as the Floods left upon the Surface of the Ground, when they drained away, and yet this Sediment is full three or four Foot thick; fot I have often obſerved, that the black Soil caſt up by Moles, or digged out of the Ditches, was a meer Compoſition of Roots, Leaves, Fibres, Spray of Wood, ſuch as the Water had brought and left behind it. In digging they often find Roots and Stumps of Oaks three or four Foot under the Surface, and they are very common in the Bottom of the Ditches and Drains: The Soil is peaty, and cut up for Fewel in ſome part of the Lordſhip; in the Bottom of theſe Peat-Pits, they find Clay, Sand, and other Sorts of Earth. Theſe Grounds have been formerly much higher: For I have obſerved Oaks and other Trees where the preſent Soil is ſo much ſhrunk and ſettled from them, that they ſtand upon high Stilts, and are ſupported from the great Fibres of the Roots, ſo that Sheep may eaſily creep under them.

That great Tract, called formerly *Vaſta Regalis*, is now by draining become good Paſturage, and yields a conſiderable Rent: It yields great Quantities of *Hay*, though much of it is of ſuch a Nature, that it will dry up a new Milch-Cow, ſtarve an Horſe, yet will it feed an Ox to admiration; and I have heard ſome Graſiers ſay, they could not by their beſt Upland-Hay feed an Ox ſo fat, as the Moor-Hay would do. This, I ſuppoſe, proceeded from its dry and binding Quality, that made the Oxen drink much.

Within the Pariſh, about half a Mile from the Church, there is a pretty Farm called *the Wall*, which I judge was formerly a *Britiſh Fortification*; it is encompaſs'd with a Moraſs, and raiſed up from Sand, broken Stones, Gravel and Rubbiſh, to a great height and breadth, being (as I meaſured it) above 1900 Yards in Compaſs, and 16, 18, and 20 Yards in Breadth: In ſome Places it ſeems to have been built before the Moors became boggy; for I could never find any Way over the Moors, by which they could carry thoſe vaſt Quantities of Earth, Clay, Sand and Rubbiſh, to raiſe that mighty Rampire. In that Pariſh I was the *ſixth Rector* from the Days of *Henry* VIII.

As to my Rectory of *Donington*, to which I was preſented *Anno* 1690, I found there as many *old People* as I did at *Kinnardſey*, if not more; and in the two Pariſhes I had but a difference of three in the Number of the People. At *Kinnardſey* I had 135 Souls, at *Donington*

138; of the 135 I had 23 aged 60 and upwards; of the 138, 24; both which Numbers multiplied by 6, the one at *Kinnardſey* was 138, the other at *Donington* would have been 144. I had nothing very remarkable at *Donington*, except the *Royal Oak*, which ſtood at *Boſcobel* within the Pariſh, and the Owners thereof paid 6 *s.* and 6 *d.* yearly, in lieu of their Tythes and Offerings: The *Royal-Oak* was a fair-ſpread thriving Tree, the Boughs of it were all lined and covered with Ivy. Here in the thick of theſe Boughs the King ſate in the Day-time with Colonel *Carlos*, and in the Night lodged in *Boſcobel-Houſe*; ſo that they are ſtrangely miſtaken, who judged it an old hollow Oak, whereas it was a gay and flouriſhing Tree, ſurrounded with a great many more: and, as I remember in Mr. *Evelyn*'s Hiſtory of Medals, there is one of King *James* I. or King *Charles* I. where there is a fine ſpread Oak with this Epigraph, *Seris Nepotibus Umbra.*

The People here live to great *Ages*; I ſaw in one Houſe three healthful People, whoſe Ages numbred together made 278, and I think they lived ſome Years after; they were the Man and his Wife, and his Wife's Brother.

I was at *Donington* about 13 Years and ſome Months; in all that time I buried but 27 People, of which Number 4 came from neighbouring Pariſhes, 4 were young ones, and of the remaining 19 the youngeſt was about 60, and the eldeſt 96 Years of Age. I was there the fourth legal Incumbent in Succeſſion from the *Reformation*; and, as I remember, at one Triennial Viſitation of the Biſhop, we had neither Burial or Wedding to return into the Regiſtry at *Litchfield.* The Country is very healthful in thoſe Parts, and though it ſeems to the Eye of a Traveller to be but of a moderate height, yet in riding between *Donington* and *Woolver-Hampton*, which is but five Miles, you croſs four Rills or Brooks in the Compaſs of three Miles, two of which run into the South-Weſt Seas, to *Severn* and *Briſtol*; the other two haſten to *Trent* and *Humber*, and ſo into the Northern Ocean.

The poor Remains of the *Royal Oak* are now fenced in by an handſome Brick-Wall, at the Charge of *Bazil-Fitzherbert* Eſquire, with this Inſcription over the Gate, (upon a blue Stone) in golden Letters.

Fœliciſſimam Arborem quam in Aſylum
Potentiſſimi Regis Caroli Secundi Deus Opt. Max.
per quem Reges regnant, hic creſcere
voluit, tam in perpetuam rei tantæ
Memoriam, quam in Specimen Firmæ
in Reges Fidei, Muro cinctam
Poſteris Commendant Bazilius
& Jana Fitz Herbert.
Quercus Amica Jovi.

It was put up about twenty or thirty Years ago, but the Place deſerved a nobler Memorial: I have writ it in ſuch Lines as they have cut it, and as the Letters now ſtand; a few Years will ruin both the Wall and the Inſcription.

A Remark by Mr. R. Thoresby. *ibid.* p. 2422.

The emblematic Medal Mr. *Plaxton* alludes to, is the XLVIth in Mr. *Evelyn*'s *Numiſmata*, which King *Charles* I. cauſed to be ſtamped in honour of the Inſtallation of his Son, whereupon is the *Royal Oak* under a Prince's Coronet, overſpreading ſubnaſcent Trees and young Suckers.

SERIS. FACTURA. NEPOTIBUS. UMBRAM.

Reverſe within the Garter of the Order is this Legend,

CAROL. M.B. REGIS. FILIUS CAROL. PRINC.
INAUGURATUR. XXII. MAII. MDCXXXIIX.

The Inſcription of *Boſcobel* reminds me of one I had from the late Reverend Mr. *Illingſworth*, Preſident of *Emanuel* College in *Cambridge*; which was inſcribed upon a Pillar erected by the Sea-ſide.

Siſte, viator, iter, veſtigia prima Secundus
Poſuit hic Carolus, quum redit Exilio.

Obſervations in Natural Hiſtory *in* Yorkſhire, *by Dr.* R. Richardſon. n. 337. p. 167. *A Boy that never made water.*

II. In the Townſhip of *North Bierley* in *Yorkſhire*, one *Worſnape*, a poor Boy, lived till he was 17 Years old, and never made Water, and yet was in perfect Health, and vigorous and active. He had conſtantly a *Diarrhœa* upon him, but without much Uneaſineſs. The Obſtruction muſt have been in his Kidneys, for he had never any Inclination to make Water. The ſerous Part of the Blood, which ſhould have been thrown off by Urine, was diſcharged by the *Cœliac* and *Meſenteric* Arteries, by the Mediation of the Glans, into the Guts. He died of a Fever.

Long Life.

A remarkable Inſtance of old Age is to be taken notice of in *Martha Waterhouſe* and *Heſter Jager*, both born in the Townſhip of *North-Bierley*, and Siſters. *Martha* married to *John Waterhouſe*; *Heſter* died unmarried. *Martha* died about two Years ago, in the hundred and fourth Year of her Age; and *Heſter*, this preſent Year 1713, in the hundred and ſeventh Year of her Age. They had both of them Relief from the Townſhip of *North-Bierley* nigh fifty Years. I ſhould not have taken notice of their Age ſeparately, it falling ſo far ſhort of ſeveral Inſtances which have happen'd in this County; but jointly, I do not remember any that have come up to them.

Fiſh.

About ſix Years ago, great Quantities of *Tench* were taken in a Pond belonging to *Stephen Tempeſt* of *Broughton* in *Craven*, Eſq; and were ſent to the neighbouring Markets. The Fiſh were taken on *Monday* towards Night, and ſome brought to *Bradford* on *Tueſday* about the ſame time; and not being frequent in our Markets, ſix of them were ſent to me by Mr. *Ferrand* the Vicar on *Wedneſday*. I not being at home, the Baſket was ſet upon the Kitchen Table, not far from a good Fire; where it continued till *Thurſday* Morning, (the Servants not knowing what was in it.) Upon opening the Baſket, and looking upon the Fiſh, I thought the Eyes of ſome of them looked clear: I put two of them into a Pail of Water, and in leſs than two Hours time they ſwam very lively in the Water. The remaining four having no ſigns of Life upon them, I put them into the ſame Pail, and before Night they all ſwam about in it.

Burbolts being a Fiſh not frequently met with in the Southern Rivers in *England*, are often found in this County, eſpecially in ſlow Rivers and ſtanding Waters, as in the River *Foſs* in *York*, and alſo in *Derwent*; but in no Place more frequent than in the Fen Ditches of the Levels, about four Miles from *Doncaſter*.

I have been ſeveral times preſent, when plenty of ſmall Trouts have been caught in the mountainous Lakes of *North-Wales* by Angling; and have, with no ſmall Admiration, conſider'd the difficult Acceſs to theſe Places, where a good Footman can ſcarce climb up to them. That theſe Lakes are yearly ſupplied from the Brooks at the bottom of the Mountains I do not at all doubt, eſpecially in ſpawning Time, when the Trouts endeavour to ſurmount all Difficulties, by paſſing up the ſmall Rivulets, to depoſit their Spawn, for the Preſervation of their Species, where it is the moſt ſecure from the Violence of other Fiſhes, and there by Accident fall into theſe natural Ponds, where they continue all Summer; no Perſon having yet obſerved (that I know of) Trouts to breed in Ponds. Not only the Trouts that are taken in theſe mountainous Lakes are ſmall, but alſo the *Charrs* that are taken as they aſcend the ſmall River out of the great Lakes nigh *Lhan Berys*, to depoſit their Spwan in the Sands there. Theſe very rarely exceed a freſh Herring in Magnitude, as I have been aſſured by Mr. *Evans*, Vicar of *Lhan Berys*, who has been preſent when hundrds of them have been caught; and by the Account he gives of them, they are in no reſpect different from thoſe taken in *Winander-Mear*, except in Magnitude, where it is no rare thing to meet with them, of two Pounds Weight and upwards. The Smalneſs in Fiſhes I have ſome time thought to proceed from the Coldneſs of the Water, theſe Lakes being ſupplied with Snow Water from the Mountains eight Months in twelve. The *Minera* of Vitriol and Alum being often met with in the Hills through which ſome of the Water muſt drain, perhaps does not a little contribute to the Roughneſs and Coldneſs of the Water. The contrary we find in our Waters that run through the Limeſtone Rocks, where no rough Salts are found; the Trouts there are large and fat. An Inſtance of this we find in the Trouts in *Malham Tarr* in *Craven*, nigh *Setle*, where they are frequently found two Foot long.

Beaſts. I muſt correct one Miſtake in Mr. *Ray*'s *Synopſis Quadruped.* &c. p. 195. where he ſays, that *Muſtela vulgaris* is called here a *Foumart* or *Fitchet*,

Fitchet. *Putorius* is called here a *Foumart*, *quaſi* foul Mart, or ſtinking Mart, in oppoſition to the Marts which emit a muſky Smell, and are often met with in our Woods, and taken by the Hunters in Snows.

The *Ermin* is not unfrequently met with here in Winter, and look'd upon, when they appear, to preſage Snow. I ſhould not here have taken notice of it, it being alſo met with in moſt Counties of *England*, but that I have had an Opportunity, in two or three Inſtances, of obſerving the Time of its Changes. It begins to change its Colour from brown to white about the beginning of *November*. I had one of them brought me about *November* was two Years, when I firſt obſerved this Change. I have ſeen one or two of them, that in the beginning of *March* were changing from white to brown. *Qu*, Whether theſe Animals do not always continue white in the more Northern Parts of the World?

Birds.

The *Nut-hatch*, or *Nut-jobber*, is not frequently to be met with in the South; yet is ſo common with us, that I have ſometimes ſeen ſix or ſeven of them in one Day in my own Woods. This muſt be the Bird that Dr. *Plot*, in his *Nat. Hiſt.* of *Oxfordſhire*, calls a *Wood-cracker*, and takes to be an undeſcribed Bird. I have with much Pleaſure often obſerved theſe Birds to crack Nuts, which they do with very great Dexterity. I ordered one of my Servants, that was with me in a Wood laſt *Chriſtmas*, to obſerve from whence ſhe fetched her Proviſion: Which he ſoon diſcover'd in a hollow Tree, and cutting the Place open, brought from thence ſeveral Pints of very choice Nuts.

I met with a Neſt of the *Regulus Criſtatus*, in a thick Thorn-Hedge, in my own Orchard, which was built round, and a little Hole at the Side; the Outſide was green Moſs, the Inſide Hair and Feathers, not much unlike that of the common Wren. The Eggs were ſmall and white, with many brown Spots upon them. The Note of the Cock is very agreeable, not much unlike ſome of the *Parus* Kind. I do not remember that I have ſeen any of theſe Birds in Summer before.

Coclea pomatia major Geſneri; I never met with it in the North; but I found it in Plenty laſt Year about the middle of *May*, in *Stunsfield* Fields, amongſt the Briers and Brakes, eſpecially nigh the famous *Roman* Pavement.

Obſervations in Natural Hiſtory *in* Wales, *by* *Mr.* E. Lhwyd, n. 334. p. 462.

III. 1. At *Snowdon* Hills we met with little or nothing additional to what is in *Ray*'s *Synopſis*; only the *little Bulb* I found plentifully in Flower.

I ſearched diligently in the Mountains of *Glamorganſhire* for figured Stones, but met with none at all, except cubical *Marchaſites* and *Cryſtals*; whereof I found one about nine Inches long, and thicker than my Wriſt, tranſparent as Glaſs for the better half, but opaque towards the Root like white Marble. Some ſmall ones I met with of the Colour of a Topaz; and was informed of others purely Amethyſtine, found in the Valley of *Nant Phrancon.* I find our Anceſtors (for want of more precious Stones) made themſelves Beads of opaque, or marble Cryſtal; for I have one given me, cut like a Lottery-ball, or perforated, found not long ſince in *Meirionydſhire.* I deſire to know, whether thoſe tranſparent Stones figured by Dr. *Plot*, and by Dr. *Liſter* [*Ph. Tranſ.* No. 201 †] by the Name of *Ombriæ*, &c. are ſo formed naturally. One of them was lately given me (ſet in Copper with a little Handle to it) by the Name of *Tlw̃s Owen Kyveiliog*, i. e. *Owen* of *Kyveiliog*'s Jewel; ſo call'd, becauſe found in an old *Crig* or *Barrow* near the Place where he lived.

† *Vid.* ſupra, V. ii. C. iii. S. lxii.

Welſh MSS. Sir *William Williams* hath ſeveral *Welſh* MSS. (though I think no Dictionary) that would be of uſe to me. They are chiefly modern Copies out of *Hengwrt* Study in *Meirionydſhire*, which I am promiſed free Acceſs to; and have this time taken a Catalogue of all the ancient MSS. it contains. There are the Works of *Talieſyn*, *Aneuryn gwawdydh*, *Myrdhyn ab Morvryn*, and *Kygodio Elaeth*, who liv'd in the *5th* and *6th* Centuries; (but the ſmall MS. containing them all ſeems to have been copied about 500 Years ago) as alſo of ſeveral others valuable in their Kind.

Quadrupeds. We have neither the *Ibex* nor *Rupicapra* in *Wales*, nor any other Goat but the common. In our Language the Park Deer is called *Geivr Danas:* The former Word ſignifies *Goats*; but whether the latter implies *Daniſh* (as if Deer had come from *Denmark*) or ſomewhat elſe, we know not.

Fiſh. Our Lakes (though they are very numerous) afford no Fiſh that I can hear of, beſides Trout and Eel, and *Torgoch* and *Gwiniad*, i. e. *Shelley* and *Charre.* A Fiſherman proteſted to me, that in a Lake called *Lhyn y Cwyn* near *Lhan Berys*, he had ſeveral times catched monocular *Trouts*, the Heads whereof were always ſomewhat diſtorted or contracted awry. They farther aſſured me, that the two higheſt Lakes of *Snowdon* (*Phynnon Urêch* and *Phynnon Las*) afford no Fiſh at all; and that the Trouts of the other Lakes differ much in Colour.

There is no Brimſtone or Pumice-ſtones on the Tops of our Mountains, nor any thing elſe that I ſuſpect to have been the Effects of Vulcano's. What ſeemed to me moſt ſtrange, were waſte confuſed Stones, and (to appearance) Fragments of Rocks, ſtanding on the Surface of the Earth, not only in wide Plains, but on the Summits alſo of the higheſt Mountains.

I have never ſeen any Lake or Spring on the Summit of a Hill. There are indeed on the Tops of ſome Hills, where ſtood anciently Caſtles or Forts, certain Wells called in Welſh *Pydew*; a Word of the ſame Signification as well as Sound with the Latin *Puteus:* But no Water runs out of theſe; and ſeveral of them I found quite dry.

ibid. p. 467. 2.] I have diſcover'd ſome new *Species* of *Gloſſopetræ*, and *Siliquaſtra*, (the firſt *Ichthyodontes*, I ſuppoſe that ever were obſerved in *Wales*) on the top of a high Mountain, called *Blorens*, near *Aber Gavenni*. The *Siliquaſtra* were ſmaller than the generality of thoſe I had obſerved in other Countries. Of the *Gloſſopetræ* we found one pretty large, but the reſt very ſmall; all black, or atro-rubent. The ſame Place afforded alſo ſome Variety of Foſſil Shells, and plenty of *Cuthbert's* Beads, which were very ſmall in compariſon of what are found throughout the North of *England*. We alſo found there a large Teſtaceous Body, not to be compared as to its Figure with any ſort of Shell yet deſcribed; together with ſome emboſſed Repreſentations of Pieces of the Skeletons of Eels, or ſome leſſer Fiſh. All theſe were in Limeſtone; but,

Foſſils.

Advancing about three Miles further into *Brecknockſhire*, at a Place called *Lhan Elbi*, we ſearched ſome Coal and Iron Mines. Their Coal-Works were not Pits ſunk like Draw-wells; but great Inroads made into the ſide of the Hill, ſo that three or four Horſemen might ride in a Breaſt. The top is ſupported with Pillars left at certain Diſtances; and they make their By-lanes (as in other Pits) as the Vein requires. The Slate above this Coal afforded only Stalks of Plants, which we did not ſave, becauſe it ſeemed impoſſible to reduce them to their ſeveral proper *Species*. However, cloſe by the Pit we found a valuable Curioſity, *viz.* a Stone for Subſtance like thoſe they make Lime of, of a compreſſed Cylinder Form, and as it were cut off even at each End; about 8 Inches long, and 3 in breadth: Its *Superficies* adorn'd with equidiſtant Dimples, like Dr. *Plot's Lepidotes*, *Hiſt. Ox. chap.* 5. *par.* 55. and in each Dimple a ſmall Circle; and in the Center of each Circle a little Stud like a Pin's Head. This is the only Curioſity of the kind I have ſeen, and is not referable to any thing I can think of either in the Animal or Vegetable Kingdom. Among the Iron Ores of the ſame Hills we found ſome new Spars, and ſeveral Specimens of Ores ſhot into a conſtant and regular Figure, though not reducible to any Animal or Vegetable Bodies.

Mines.

About 5 Miles thence, at a Place called *Pont y Pwl* in this County (where, as alſo at *Elban Elbi* there are Furnaces and Forges,) we found more Coal and Iron Mines, and collected ſome fair Repreſentations of the Leaves of capillary Plants on the Iron Ore, but found no Branches. One Major *Hanbury* of this *Pont y Pwl* ſhewed us an excellent Invention of his own, for driving hot Iron (by the help of a rolling Engine moved by Water) into as thin Plates as Tin. They cut their common Iron Bars into Pieces of about two Foot long; and, heating them glowing hot, place them betwixt theſe Iron Rollers, not acroſs, but their Ends lying the ſame way as the Ends of the Rollers. The Rollers (moved with Water) drive out theſe Bars to ſuch thin Plates, that their Breadth, which was about 4 Inches, becomes their Length, being extended to about 4 Foot; and what was before the Length of the Bars, is now the Breadth of the Plates. With theſe Plates he makes Furnaces, Pots, Kettles, Sauce-pans, *&c.* Theſe he can afford at a cheap Rate, (about the third Part of what is uſual) and yet dares warrant them not leſs ſerviceable.

n. 335. p. 500. 3.] In a ſteep Rock called *Craig y Park*, others in the Pariſh of *Yſtrad Dyvodog*, we obſerved divers Veins of Coal, expoſed to ſight as naked as the Rock; and found a Flint-Ax, ſomewhat like thoſe uſed by the *Americans.*

Figured Stones. At *Goldcliff* in *Monmouthſhire* we had ſome variety of formed Stones: But what pleaſed me moſt, was an *Aſteria* or Column Star-Stone, beſet with Sprigs the whole Length of it, iſſuing from the Commiſſures of the Plates.

This County abounds with *Entrochi*; one whereof I ſaw in a Rock at the Iſle of *Barry*, above 15 Inches in Length; and another about 10 Inches long, but as thick as a Cane. We took their Figures and Dimenſions, but could not get off the Stones without breaking.

Inſcriptions. Fig. 60. At *Kaer phily* Caſtle the People ſhewed us an Inſcription (as they ſuppoſed) on one of the Steps of the Tower, *Fig.* 60. I muſt confeſs I am not fully ſatisfied whether it were ever deſigned for reading, or for ſome kind of antique Ornament; but rather incline to the latter. The Stone was not deſigned for a Step, there being none of the ſame kind in the whole Stair-Caſe. The Marks were moſtly worn out by treading; and 'tis poſſible they might be once more uniform; and ſome few Miſtakes may have happened in the copying it as it is. I have ſent the Stone to the *Muſeum* at *Oxford*, where the Curious may be ſatisfied. Were it the old *Celtic* Character, which *Cæſar* ſays was like the *Greek*, it were a noble Diſcovery: But I fear our Anceſtors (if ever they had any Writing) have left us none upon Stones.

Fig. 59. I alſo copied the Maſons Marks on ſome Stones there; whereby perhaps ſome Perſons, curious in Architecture, may judge whether it has been a *Roman*, or later *Britiſh* Building: I ſay *Roman* or *Britiſh*, becauſe the *Saxons* and *Danes* never ſettled here; and it is older than the *Norman* Conqueſt.

Fig. 61. *Figure* 61 repreſents certain Plates which frequently occur amongſt the *Entrochi* of this County.

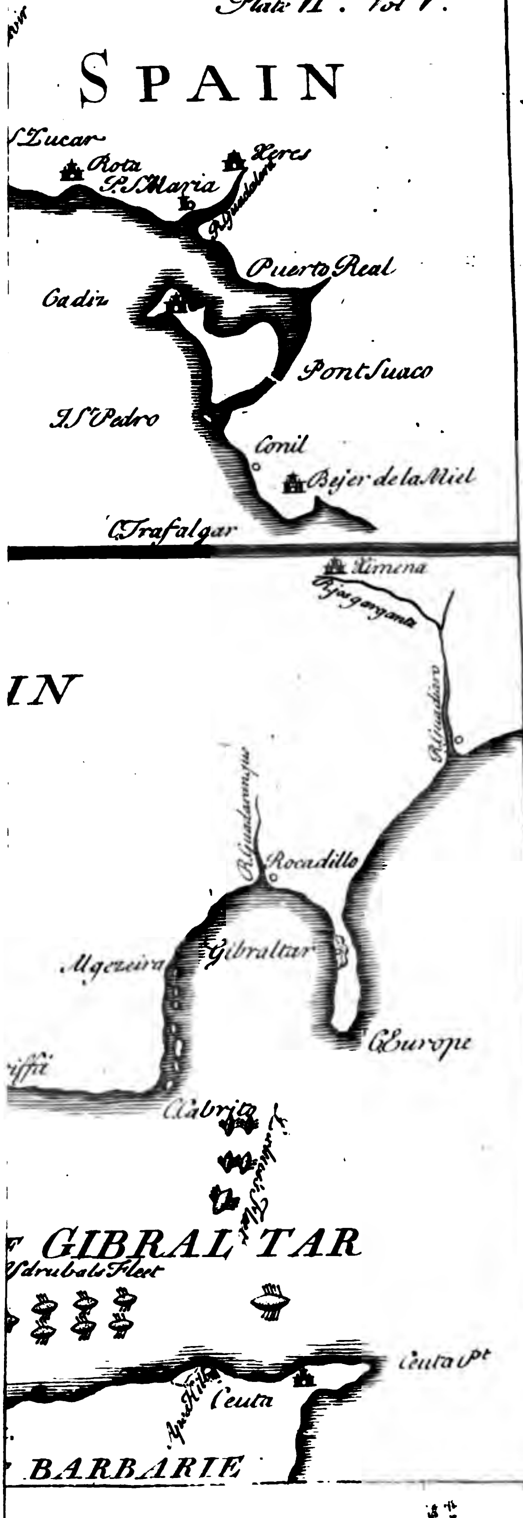
—*in* Cornwall. n. 336. p. 527. 4.] I have met near *Penzans* with two or three *Stellæ*, and ſome other *Exanguia Marina*, which I have not ſeen before on our *Britiſh* Coaſts.

We have alſo found ſome *Fuci*, which perhaps may be new, and I am told that the Fiſhermen ſometimes take up the *Corallina Marina reticulata* by their Hooks.

n. 337. p. 93. 5.] Amongſt ſeveral others, I found one large Cryſtal above *Phynnon Urêch*, about 7 Inches long, and as thick as my Wriſt. In *Monmouthſhire* I met with large petrified *Vertebræ*, and ſome few formed Stones in each County.

Plate VI. Vol V.

Part II. Page 120



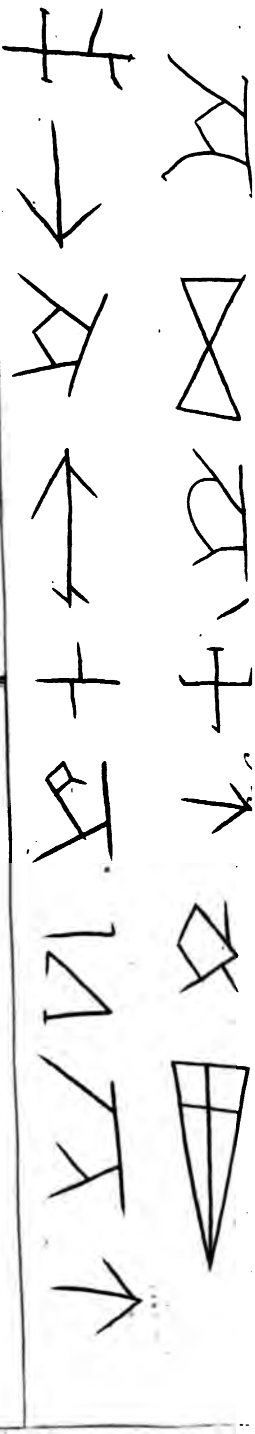


Plate VII. Vol. V. Part II. p. Page. 120

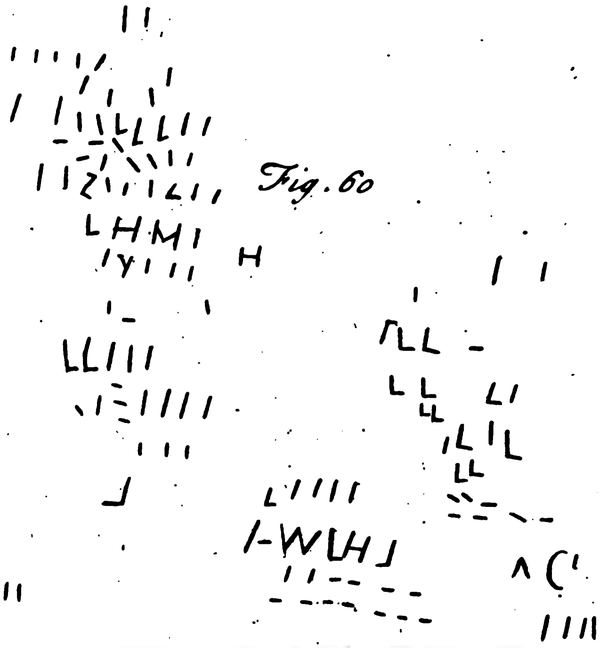


Fig. 60

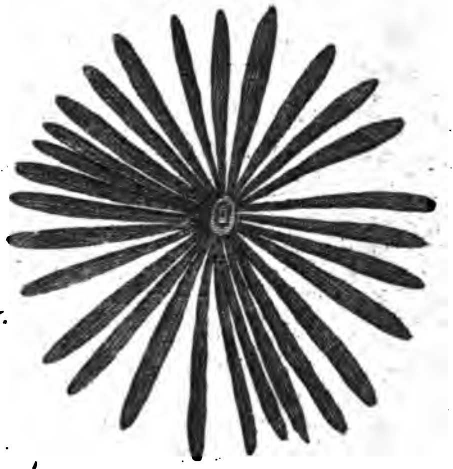


Fig. 65.

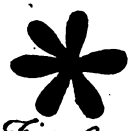


Fig. 64

J. Harris Sculp.

I ſpent three or four Days in the Coal-Pits of the Foreſt of *Dean*, where I found moſt of the Capillaries, beſides ſome other new Plants, together with two Species of *Aſtropodium* gathered on the *Severn* Shoar; the only Rarities of the kind, I ſuppoſe, that have been diſcovered. I doubt not but the Coal Plants have been obſerved by the Workmen long ſince, though they eſcaped the Notice of Naturaliſts, who till this laſt Century contented themſelves with bare reading and ſcribbling Paper. I find it well known to all our Country Colliers by the Name of *Carreg Redynog*, i. e. the Ferny Stone; and one Mr. *Williams*, Archdeacon of *Cardigan*, told me he had obſerved much finer Patterns 25 Years ſince in the Coal-Pits of *Glamorganſhire*, than ſome that I ſhewed him. The whole *Braken* that *Kirkman* mentioned, was a noble Curioſity: We ſaw none ſuch in the Foreſt; tho' we found them much larger than thoſe you ſent. The Stalks of Fern and Harts-tongue I think we often met with, but cannot ſay we ſaw any Roots. Indeed I know not well whether the Impreſſions of the Stalks might be eaſily diſtinguiſh'd from thoſe of the Roots. We alſo often met with the membranaceous Subſtance of Leaves; and perhaps one or two of theſe Figures I ſend are the Repreſentations of ſome Flowers. Coal *Plants*.

Fig. 62. *Aſtropodium furcatum: ſive ſtellæ marinæ Magellanicæ Radij lapidei.* Fig. 62.

Fig. 63. *Aſtropodium ramuloſum: ſive ſtellæ arboreſcentis Virgultum lapideum.* Fig. 63.

Fig. 64. *Hexapetalon carbonarium.* Fig. 64.

Fig. 65. *Radiatula*, &c. *An Flos cujuſdam Chryſanthemi?* Fig. 65.

Fig. 66. *Phillitis trifolia.* Fig. 66.

Fig. 67. *Abietis, an potius Lycopodij cujuſdam ramulus?* Fig. 67.

I have been very inquiſitive about Coins of the Princes of *Wales*, but could never ſee one of them; tho' the Biſhop of *Bangor* told me a Relation of his kept one of *Lhywelyn 'ab Iorworth*, who was contemporary with *Richard* I. and K. *John*, in his Pocket ſeveral Years, and ſhewed it many of the Biſhop's Acquaintance, ſtill living, who confirm it. By the Princes of *Wales* I underſtand the *Britiſh* Princes from K. *Kadwaladr* about the Year 600, to the laſt Prince *Lhewelyn ap Gruffydh* about the Year 1280. I have found ſeveral of the more ancient *Britiſh* Coins; whereof you ſee divers Figures in *Cambden*. Mr. *Nicholſon* quotes *Cæſar* for the *Britons* having no Coins; whereas, on the contrary, *Cæſar*'s Words are, *Nummo utuntur parvo & æneo:* Nor can I ſee any Reaſon to doubt of *Britiſh* Coins of all Sorts of Metal, till he or ſome other inform whoſe Coins thoſe are which Mr. *Cambden* and other Writers take to be *Britiſh*. *Welſh* Coins.

The Druid Beads are generally Glaſs. Since the laſt Edition of *Cambden* I have met with two or three of them, that had a Snake manifeſtly painted round them: So that I take it for granted, the *Ova Anguina* of the *Britiſh* Druids were theſe Glaſs Beads; tho' thoſe of the *Gauliſh* were the Shells of the *Echini orbiculati laticlvavii.* *Beads.*

Plants. We ſearched this Summer the high Mountain by *Brecknock*, called *Y Van uwch deni*; we met with *Sorbus legitima*, and *Sorbus torminalis* (grown to as great a height as the *Ornus)* neither of which had ever occur'd before in *Wales*. But of all theſe Topical Plants I was ſurprized at none ſo much as the *Capillus Veneris verus*, growing very plentifully out of a marly Incruſtation, both at *Barry* Iſland and *Porth Kirig* in *Glamorganſhire*, and out of no other Matter; and alſo that *Gnaphalium majus Americanum* ſhould grow on the Banks of *Rymny* River (which runs altogether over Iron-Stone) for the Space of at leaſt 12 Miles, beginning near the Fountain-Head in a Mountain of this County; and yet not a Plant of it to be ſeen elſewhere throughout *Wales*. In a great Lake called *Lhyn Savadhan* I found a pellucid Plant I had never met with before: The Leaves are extraordinary thin and tranſparent, in Form not unlike ſmall Dock-Leaves; but the middle Rib is continued beyond the Extremity, ſo that each Leaf has a ſoft Prickle at the End: We found there alſo the *Hippuris ſaxea*, and two elegant Sorts of ſmall Leeches, which I ſuppoſe not deſcrib'd.

The Limeſtone of this County affords ſmall *Gloſſopetræ* and *Siliquaſtra*; but they are but very ſcarce in compariſon of the Quantity found in *Oxfordſhire*, *Northamptonſhire*, *Berks*, &c. The moſt conſiderable Rarities it affords are *Fairy Cauſeways*, which I call ſo in imitation of their *Giants Cauſeway* in *Ireland*, *ſi liceat magnis componere parva*: For whereas theirs may be half a Mile long, ours ſeldom exceed three Foot. Our Lime Quarries yield two or three Bodies congenious with it, though of a very different Form; and perhaps all may be referable to the *Coralline* Claſs.

Fig. 68. *Fig*. 68. A green Adder's Bead adorn'd with Snakes Skeletons of a Citrine Colour.

Fig. 69. *Fig*. 69. A black Adder's Bead adorned with nine ſmall Snakes, or *cornua Ammonis*, of a whitiſh Blue.

Fig. 70. *Fig*. 70. An Adder's Bead reſembling Cherry-tree Gum, adorn'd with a Snake chequer'd of blue and white.

—n. 337. 6.] I here ſend the Draught of a remarkable *Sea Plant (Fig*. 71.)
p. 275. which we met with a dredging for Oyſters, near *Lhan Dangw* in *Meirionydſhire*.
Fig. 71. *A* Sea Plant, &c. The whole Plant is of a Straw-colour, and much of the bigneſs the Figure repreſents it.
Fig. 71. The Stems are hollow, and fill'd with a kind of thick reddiſh Liquor, as much like Blood or Gore as the Juice of Plants; inſomuch that it ſeems referable to the *Zoophytes*. If you preſs theſe Stems at the Bottom betwixt your Fingers, the red Liquor is forc'd up, and cauſes the drooping Flowers (or Seed-veſſels) to mount erect.

We have lately diſcover'd a ſort of *Marble* in that County, which when poliſh'd repreſents a Number of ſmall Oranges cut a-croſs; the Reaſon whereof, is an infinite Quantity of *Porus* (or *Alcyonium)* ſtuck through the Stone. This might ſerve well for inlaying Work, as Tables, Windows, &c.

Wales affords a great Quantity of *Allum* and *Copperas*; particularly *Pembrokeſhire*, and *Caermarthenſhire* for the former; and *Meiriondyſhire* for *Copperas*, where I ſaw a great Vein of *Pyrites* ſtrongly impregnated.

IV. In this Kingdom our Travels in the High-lands were through *Cantire*, *Argyle* and *Lorn*, beſide the Iſles of *Mac y Chormic*, *Mul* and *y Columb Kil*; and in the Low-Lands through *Glaſgow*, *Sterling* and *Edenbrough*. In the High-Lands we found the People every where civil enough; and had doubtleſs ſped better as to our Enquiries, had we had the Language more perfect.

Obſervations in Natural Hiſtory, *&c.* *in* Scotland, *by the* ſame. *n.* 337. *p.* 97.

We met with ſeveral Inſcriptions, but none of them *Roman*, nor indeed ancient: However, we copied all we met of two hundred Years ſtanding, *&c.* for the ſake of the Orthography of the *Iriſh* Names, which are writ differently from what is now uſual.

We alſo took Figures of ſome Variety of their *Broaches*, or Silver and Braſs *Fibulæ* uſed by the Women to claſp their *Koleriv*, a Garment anſwering our Nightrails.

But what we were moſt diverted with, was their Variety of Amulets; many of which, (if not all) were certainly uſed by the *Druids*, and ſo have been handed down from Parents to Children ever ſince. Some of theſe may be render'd in *Engliſh*. 1. *Snake-button*. 2. *Cock-knee-Stone*. 3. *Toad-ſtone*. 4. *Snail-ſtone*. 5. *Mole-ſtone*. 6. *Shower-ſtone*, and, 7. *Elf-arrow*.

Amulets.

The *Snake-button* is the ſame deſcribed in the Notes on *Denbighſhire*, in *Cambden*, by the Name of *Adder-Beads*: But there are of theſe great Variety, as to Colour and Ornament; inſomuch, that betwixt *Wales* and the High-Lands, I have ſeen at leaſt fifty Differences of them. In *Ireland*, though they are tenacious enough of all old Cuſtoms, I could hear nothing of them: So I conculde, that either the *Iriſh* had no *Druids*, or that their want of Snakes fruſtrated their advancing that Impoſture amongſt the People: But there were but a few Places where we enquired; and perhaps we may hereafter hear of them in other Parts of that Kingdom. Not only the Vulgar, but even Gentlemen of good Education throughout all *Scotland*, are fully perſuaded the Snakes make them, though they are as plain Glaſs as any in a Bottle.

The *Cock-knee* Stone is an *Echinites pileatus minor* of Flint; which they firmly believe to be ſometimes found in the Knees of old Cocks; and a Fellow in *Mul* proteſted to me, (though I was never the nearer believing him) that he had with his own Hands taken one of them out of a Cock's Knee; and named two or three others, who had done the like.

The *Toad-ſtone* is ſome Pebble, remarkabie for its Shape, and ſometimes Variety of Colours. This is preſumed to prevent the burning of a Houſe, and the ſinking of a Boat: And if a Commander in the

Field has one of them about him, he will either be ſure to win the Day, or all his Men ſhall fairly die on the Spot.

The *Snail-ſtone* is a ſmall hollow Cylinder of blue Glaſs, compoſed of four or five Annulets; ſo that as to Form and Size it reſembles a middling *Entrochus.* This, amongſt others of its myſterious Virtues, cures ſore Eyes.

The *Mole-ſtones* are Rings of blue Glaſs, annulated as the aforeſaid Snail-ſtones.

They have the *Ombriæ pellucidæ*, (which are Cryſtall Balls or Hemiſpheres, or depreſſed Ovals) in great Eſteem for curing of Cattle; and ſome on *May* day, put them into a Tub of Water, and beſprinkle all their Cattle with that Water, to prevent their being Elf-ſtruck, bewitch'd, *&c.* And,

As to this *Elf-ſtriking*, their Opinion is, that the Fairies (having not much Power themſelves to hurt Animal Bodies) do ſometimes carry away Men in the Air, and furniſhing them with Bows and Arrows, employ them to ſhoot Men, Cattle, *&c.* I doubt not but you have often ſeen of thoſe Arrow-Heads they aſcribe to Elfs or Fairies: They are juſt the ſame chip'd Flints the Natives of *New-England* head their Arrows with at this day; and there are alſo ſeveral Stone Hatchets found in this Kingdom, not unlike thoſe of the *Americans.* I never heard of theſe Arrow-Heads nor Hatchets in *Wales*; and therefore would gladly be informed whether they have ever been found in *England.* Theſe Elf-Arrow-Heads have not been uſed as Amulets above thirty or forty Years; but the Uſe of the reſt is immemorial: Whence I gather they were not invented for Charms, but were once uſed for ſhooting here, as they are ſtill in *America.* The moſt Curious, as well as the Vulgar throughout this Country, are ſatisfied they often drop out of the Air, being ſhot by Fairies, and relate many Inſtances of it; but for my part I muſt crave leave to ſuſpend my Faith, until I ſee one of them deſcend.

Near *Glaſcow* we found two Foſſils *toto genere* new: One reſembling the ſmall Joints of a Lobſter's Arm, but much longer; the other ſomewhat like a large *Gloſſopetræ*, or perhaps like the *Mucro* of a *Pinna Marina.* Theſe figur'd Stones are found there in an Iron-Stone, tho' I never ſaw them in that kind of Matter in *Wales.* We found both Shells and *Entrochi* gone off to that Sbſtance, having changed their Matter and much of their Shape.

Near the ſame Town, ſearching for theſe Foſſils, I found in the midſt of the Lime-ſtone ſome *Cochlitæ* compoſed of Flint; but *Conchitæ* of Spar gone off ſo far from the Shape of Shells, as hardly to be known, were it not from others in the ſame Place retaining their Shape more entirely.

The Principal of the College ſhew'd us Stones he had lately procured for the Library, having *Roman* Inſcriptions. Theſe we copied, and ſeveral others elſewhere of the ſame Date; whereof ſome are printed in *Cambden* (tho not very correctly) and others not yet publiſh'd. They keep theſe Stones at *Glaſcow* very carefully in the Library; and the Principal was daily expecting two or three more that had been promiſed him.

Obſervations in Natural Hiſtory, *and* Antiquities *in* Ireland, *by the* ſame. n. 335 p. 503.

V. 1.] We continued not above three Days at *Dublin*, when we ſteer'd our Courſe towards the *Giants Cauſeway*. The moſt remarkable Curioſity we ſaw by the way, was a ſtately Mount at a Place called *New Grange* near *Drogheda*; having a number of huge Stones pitch'd on one end round about it, and a ſingle one on the top. The Gentleman of the Village (one Mr. *Charles Campbel*) obſerving that under the green Turf, this Mount was wholly compoſed of Stones, and having occaſion for ſome, employ'd his Servants to carry off a conſiderable Parcel of them; till they came at laſt to a very broad flat ſtone, rudely carved, and placed edgewiſe at the bottom of the Mount. This they diſcovered to be the Door of a Cave, which had a long Entry leading into it. At the firſt entring we were forced to creep; but ſtill as we went on, the Pillars on each ſide of us were higher and higher; and coming into the Cave, we found it about 20 Foot high. In this Cave, on each hand of us, was a Cell or Apartment, and another went on ſtraight forward oppoſite to the Entry. In thoſe on each hand was a very broad ſhallow Baſon of Stone, ſituated at the Edge. The Baſon in the right-hand Apartment ſtood in another; that on the left-hand was ſingle, and in the Apartment ſtraight forward there was none at all. We obſerved that Water dropt into the right-hand Baſon, tho' it had rained but little in many Days; and ſuſpected that the lower Baſon was intended to preſerve the ſuperfluous Liquor of the upper, (whether this Water were ſacred, or whether it was for Blood in Sacrifice) that none might come to the ground. The great Pillars round this Cave, ſupporting the Mount, were not at all hewn or wrought; but were ſuch rude Stones as thoſe of *Abury* in *Wiltſhire*, and rather more rude than thoſe of *Stonehenge*: But thoſe about the Baſons, and ſome elſewhere, had ſuch barbarous Sculpture (*viz.* ſpiral like a Snake, but without diſtinction of Head and Tail) as the forementioned Stone at the Entry of the Cave. There was no Flagging nor Floor to this Entry nor Cave; but any ſort of looſe Stones every where under Feet. They found ſeveral Bones in the Cave, and part of a Stag's (or elſe Elk's) Head, and ſome other things. which I omit, becauſe the Labourers differ'd in their Account of them. A gold Coin of the Emperor *Valentinian*, being found near the Top of this Mount, might beſpeak it *Roman*; but that the rude Carving at the Entry and in the Cave ſeems to denote it a barbarous Monument, So the Coin proving it ancienter than any Invaſion of the *Oſtmans* or *Danes*, and the Carving and rude Sculpture, barbarous; it ſhould follow, that it was ſome Place of Sacrifice or Burial of the ancient *Iriſh*.

Vid. ſupra, V. ii. C. iii. S. lxxvi.

The *Giants Cauſeway* is ſo well deſcribed in the *Phil. Tranſ.* [Nº 212, & 241.] that nothing can be added to that Account of it. We have the ſame Stone on the Top of *Cader Idris*, one of the higheſt Mountains of North-*Wales*; but ours is leſs elegant, and does not at all break off in Joints; nor could I ſatisfy myſelf that there are ſet Joints (as in the *Entrochus* and *Aſteria*) in the *Baſaltes* of *Ireland*; but that it is the Nature of the Stone to break off in ſuch a convex Form. However, we could perceive no Seams in theſe Pillars, excepting on thoſe Sides that were expoſed to the Weather.

Another remarkable Curioſity we met with, was a Copper-Trumpet like a Sow-Gelder's Horn; having the Hole for ſounding near the midſt, and two Rings at the ſmaller End, above two Foot long. Three of theſe were found in an old *Carn* (*i. e.* a great Heap of Stones) at *Balle Niwr* near *Carreg Fergus*.

We could make nothing of the Petrifying Quality of *Loch Neach*; but that they ſometimes find Stones there, having the Grain of Wood.

We met with ſome *Iriſh* Inſcriptions there, and others here; which none of the Critics in that Language we converſed with could interpret.

Near *Larne* in *Antrim* we met with one *Eoin Agniw*, whoſe Anceſtors had been Hereditary Poets for many Generations, to the Family of the *O-Neals*; but the Lands they held thereby being taken away from his Father, he had forſaken the Muſes, and betaken himſelf to the Plough: So we made an eaſy Purchaſe of about a dozen ancient Manuſcripts on Parchment.

The *Potato* is not indigenous of *Ireland*. The *Arbutus* is, for what I can yet underſtand, the ſame with the common: And for the *Sabina*, I doubt my Friend I ſent to *Kerri* (whom I have not yet ſeen) will bring me no News of it.

I have the Account of the living Foſſil Muſcles atteſted and ſigned by the four Perſons preſent at the finding them; ſo that nothing but its being a ſingular Inſtance makes me ſcruple the Relation: But the Labourers have ſuch a Character for Veracity, that I rather incline to believe it, than to doubt.

n. 336. p. 524.

2.] For Antiquities, *Ireland* affords us no great Variety. I have in divers Parts of the Kingdom pick'd up about 20 or 30 *Iriſh* Manuſcripts on Parchment; many of which are inſignificant Romances But the Ignorance of their Critics is ſuch, that tho' I conſulted th chiefeſt of them, as *O-Flaherty* (Author of the *Ogygia*) and ſever others, they could ſcarce interpret one Page of all my Manuſcript and this is occaſion'd by the want of a Dictionary of that Languag What I moſt value amongſt them are their old Laws, which mig give ſome Light to the Curious as to many of their National Cuſtom and ſome of their old Poems: But all are of uſe to any that wou

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compoſe a Dictionary of that Language; which was anciently (conſidering the Narrowneſs of their Knowledge as to Arts and Sciences) doubtleſs very copious.

I ſaw no *Coins* found there, but a *Roman* Gold Coin of *Valentinian* Jun. ſeveral of our old *Engliſh* ſince the Conqueſt; and one caſt Braſs Piece inſcribed with *Runick* Letters, which I take to have been a *Daniſh* Amulet.

Several of our old *Britiſh* Monuments, called *Kaer*, *Karn*, *Cromlech*, &c. we met with; and found that they diſtinguiſhed them by the ſame Names.

What were peculiar to themſelves, were their high round Towers for Belfreys; their round Intrenchments, commonly called *Danes* Rathes: and the Elf-Arrow Heads of Flint.

About *Slego* and *Bali Shany* we had good Succeſs as to figur'd Stones; where we met with Variety of *Aſtropodia* and *Aſtrorrhizæ*, or *Modioli*, not yet figured or deſcribed, together with other Curioſities in that kind; all which (together with the Manuſcripts) I have long ſince ſent to *Oxford*.

In the ſame Neighbourhood, on the Mountains of *Ben Bulben* and *Ben Buiſhgen*, we met with a Number of the rare Mountain-Plants of *England* and *Wales*, and three or four not yet diſcover'd in *Britain*.

In moſt of the Mountains of *Galloway* and *Mayo* grows an elegant Sort of Heath, bearing large Thyme-Leaves, a Spike of fair purple Flowers like ſome *Campanula*, and viſcous Stalks. I know not whether it be any thing related to the *Ciſti Ladaniferæ*.

In the ſame Places *Pinguicula flore carneo minore* is a common Plant, and a ſort of *Ros Solis*, which I take to be undeſcribed.

On the Mountains of *Keri*, *Sanicula guttata* grows in abundance; together with ſome other rare Plants: But the Tories fruſtrated our Curioſity here, tho' no where elſe in the Kingdom.

We met with ſome Marine Animals of the Exanguious kind, that were Strangers to us.

VI. When the Small-pox is Epidemical in the main Land over againſt *Skie-Iſle* on the S. E. and Eaſt, and likewiſe in *Skie-Iſle*, the Natives bathe their Children in an Infuſion of *Juniper* Wood, and they generally eſcape; whereas thoſe who neglect this Precaution, are obſerv'd often to die: Of this I have ſeen ſeveral Inſtances.

Medical Obſervations in Scotland, by Mr. M Martin, *n.* 312. *p.* 2470.

The Plant *Water-Lilly* being apply'd to the pain'd Part of the Body where a *Felon* is fix'd, it is obſerv'd that it forces its Paſſage quickly in that Place through the Skin.

The *Red-hot* Iron is commonly uſed in piercing an Inch deep in the Arms or Legs, and cures ſeveral Diſtempers.

A Wound or *Scarification* acroſs the Crown of the *Hedd* cures Fluxes and *Dyſenteries*. The Blood being ſtanch'd, the Wound is cur'd as other Wounds commonly are.

Silverweed is uſed as Hops in brewing Beer.

VII.

Plate VII. Vol. V. Part II. p.
Page. 120

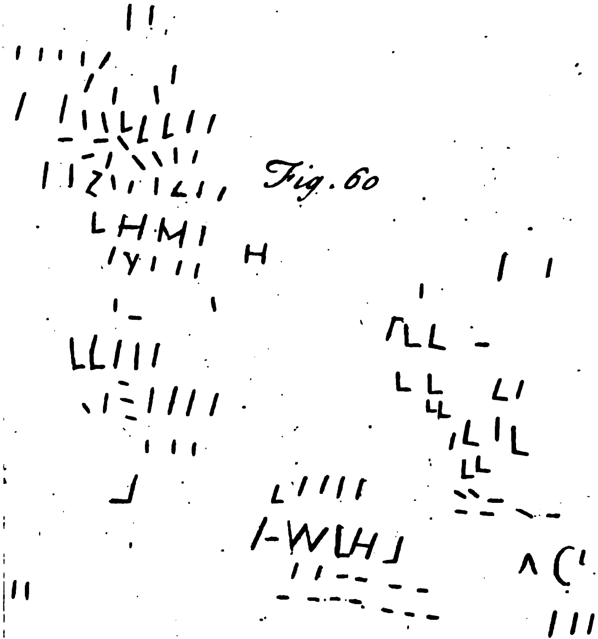
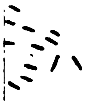


Fig. 60



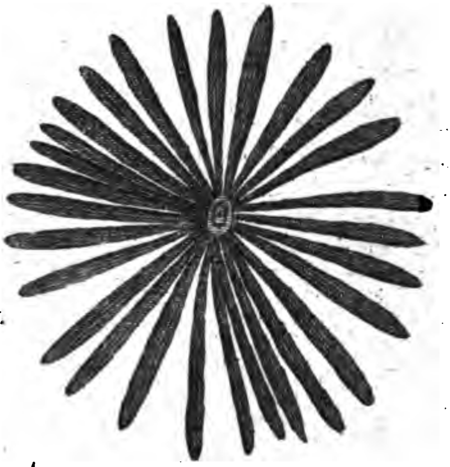
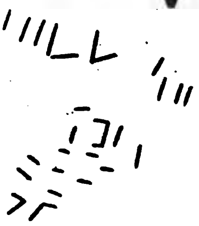


Fig. 65.



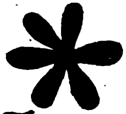


Fig. 64

J. Harris Sculpt

if not all, Inhabitants of the Surface of the Earth, ſhould be caught in it, if it were only Liquid when in the Bowels of the Earth.

9. A numerous Collection of very large Branches of *Coral*, white and red, and one black.

10. A large pair of *Stags Horns* growing out of a Piece of wood, after a very ſtrange manner.

11. Another Branch of a *Stag's Horn*, with a large piece of Wood naturally adhering to the Top of it; the Top of the Horn piercing the very Body of the Wood, and growing ſome Inches beyond it.

12. A *Sheep*, with a Horn growing out of its *Side* about a Foot long.

13. I meaſured the *Thigh-bone* of a *Human Body*, I ſuppoſe, that was three Foot and three Inches long; the Head was two Foot and five Inches round, and the middle of it was nineteen Inches and a half about.

14. Two very large *Scollop Shells*, that weigh two hundred twenty-four Pounds each.

15. A Piece of *Marble*, with a *natural* Repreſentation of a *Crucifix* on its Outſide, mightily valued by the *Lutherans*. And I remember Dr. *Hartman*, who wrote *de Succino Pruſſiaco*, ſhew'd me at *Koningsberg*, in *Pruſſia*, a Piece of whitiſh Amber, having a Woman with a Child in her Arms prettily repreſented by Variety of Colours on the Superficies. I ſuſpected it to be Artificial; but he aſſured me the contrary, and kept it very religiouſly.

There were beſides theſe a great many more natural Rarities, which my ſhort Stay there would not permit me to examine.

Artificial Curioſities.

Amongſt the Artificial Curioſities: 1. A *Skeleton* made of *Ivory* in imitation of a Human Skeleton, two Foot and ſix Inches long, ſo artificially and curiouſly put together, that any one well ſkill'd in Oſteology may take it for a natural one.

2. Two *Crucifixes* of *Ivory*, with the whole Hiſtory of our Saviour's Paſſion, extremely well carved and expreſt, and are both a very pretty Curioſity. I ſaw there a great Variety of Nicknacks made of Ivory, curiouſly wrought on the Outſide: A ſmall *Man of War* of Ivory, with Silver Guns in it; ſeveral ſmall *Sloops* and *Galleys* of the ſame, and one of the Unicorn's-Horn, with a Gold Anchor.

3. A *Watch* made of *Ivory*, with all its Wheels and Motions. Several other Utenſils made of Ivory and Unicorn's-Horn, prettily carved and turn'd: Beſides ſome others of Ebony, Heart Oak, Box, Amber, Silver, Braſs, &c. which are kept together for the Curioſity of the Workmanſhip.

4. In another Chamber there is nothing but the Garments, Arms and Utenſils of *Indians*, *Turks*, *Greenlanders*, and other barbarous Nations, which for their Number and Variety entertain the Eye with a very agreeable Pleaſure.

5. A Perſpective of the late King of *Denmark*'s Family, the Queen's Face being in the Middle, and eight Princes and Princeſſes round her;

yet all club to make the Face of the King, thro' a Hole of a Glaſs Tube.

6. Six *Golden* Sepulchral *Urns*, found in the Iſland of *Fuenen*, *an.* 1685, by a Boor there, as he was ploughing his Land; they were full of Aſhes or greyiſh Earth when found. The biggeſt is two Ounces and a half, the other five about two Ounces and a Drachm. This confirms the Accounts given us by *Saxo Grammaticus*, *Olaus Wormius*, and others, that it was a very ancient Cuſtom among the Northern Nations to burn their Dead, and then bury their collected Aſhes in Golden Urns. They were very thin, and had three Rings of Gold round their Necks, and ſeveral Circles one within another, with one common Center carved on the Outſide round the Body of the Urn. They held between four and five Ounces of Liquids.

7. Another Sepulchral *Urn* of *Cryſtal*, of a conical Figure, found near *Bergen* in *Norway* about thirty years ſince, with a Gold Wire about it, that weighs eight Ounces.

8. I ſaw in another Chamber ſeveral *Urnæ Lacrymales*, in which were collected the Tears of Friends, which afterwards the old *Romans* mix'd with the Aſhes of the Dead: Theſe were ſome of Glaſs, and ſome of Earth, and of ſeveral Sizes. Braſs *Lamps* of ſeveral Magnitudes and Shapes; ſome of other Metals, others of Earth, in the ſhape of Animals or Idols, that were worſhipped by the Ancients. The *Stilus Æneus* of the *Romans*, the one end ſharp, the other blunt; the firſt to write with, the other to rub out what was written.

9. The large *Daniſh Horn*, of pure Gold, weighs an hundred two Ounces and an half, is two Foot and nine Inches long, and holds about two Quarts of our Meaſure. This Horn was found *anno* 1639, accidentally by a Country-Girl in the Dioceſe of *Rippon* in *Jutland*: 'Tis no doubt, ſome *Runic* Piece of great Antiquity, by the Figures carv'd on the outſide, which ſeem to be Hieroglyphicks, monſtrous Shapes of Devils, Hobgoblins, &c. perhaps ſome of theſe might repreſent their Gods, and probably this Horn was uſed in their Sacrifices, as of old among the *Aſſyrians*, and other ancient Nations, who were wont on ſolemn Occaſions to entertain the Croud with mighty Noiſes of Horns and Trumpets, or rather to drink out of at their ſolemn Treats.

10. The *Oldenburgh Horn*, of pure Silver, gilt with Gold, and variouſly enamell'd with green and purple Colours, and weighs about four Pounds. The *Daniſh* Antiquaries tell us ſtrange fabulous Stories of this Horn, which I ſhall omit at preſent; only obſerving, that whereas they ſay this Horn was given to Earl *Otho* of *Oldenburgh*, *anno* 989, by the Workmanſhip of it 'tis plain it cannot be of that Date: for the Figures and Characters engrav'd and emboſs'd on its Outſide are modern; which, with the Enamelling and other Ornaments, all curiouſly done, pleaſe the Sight mightily, and make a very fine, as well as valuable Curioſity. I found in the ſame Chamber a great many

Horns of this kind, ſome in Metal, ſome of Bullocks Horns tipt with Gold about the Edges, others of Ivory, Unicorns Horns, &c. all prettily wrought on the Outſide with great Variety of Emblematical Fancies, according to the Humours of thoſe Countries and Times they were made in; which were ſo many Cups to drink out of at their ſolemn Entertainments; and this of *Oldenburg* was finer than the reſt, becauſe deſigned for the Royal Table. 'Tis ſaid to be made by Command of *Chriſtian* I. who lived in the fifteenth Century, and did it in honour of the three Kings of *Cullein*.

Tycho Brahe's *Caſtle*.

I went one day aſhore on the Iſland of *Weenen*, which our Sailors call *Scarlet Iſland*, from a Tradition, that Q. *Elizabeth* offered as much Scarlet Cloth for it as would cover it. This Iſland is now an Appendix to *Schonen* in *Sweden*, not above half a League from the main Land. Here I obſerv'd the Ruins of *Tycho Brahe*'s Caſtle, which he built on this Iſland, given him by King *Ferdinand*, who ſupply'd him with Money for the carrying it on in the Year 1567. This Caſtle was built in the middle of the Iſland, but is now demoliſh'd, and quite razed to the Ground, and all the Vaults and under-ground Works fill'd up, except the large Obſervatory, which, *Gaſſendus* tells us, was diſtinguiſh'd from all the reſt of his Apartments under-ground, that were very many, by a ſolid round Stone Wall, part of which remains ſtill. This was his great Obſervatory, and was called by him *Stellæburgum*, or the City of Stars; as the Caſtle was *Uraniburgum*, or the City of the Heavens. The Situation was pleaſant no doubt, it being on a very little riſing Ground, in the middle of a plain Iſland, not above three Miles round. The ſame Author tells us, the King of *Denmark*'s Liberality was ſo great towards this learned Man, that the beſt Workmen were employ'd about it, and every thing well contrived both for Pleaſure and Conveniencies of Room, for Inſtruments and Aſtronomical Obſervations above and under-ground, beſides noble Gardens, Fiſh-Ponds, and a Park; But by the Fate of War between *Sweden* and *Denmark*, no one Stone is left of this magnificent Superſtructure. His Inſtruments that were very fine, are now ſcattered up and down in *Germany*, and ſome few remain in *Copenhagen*; his own Cœleſtial Globe I ſaw there in the *Round* Tower, which was ſix Foot and three Quarters in Diameter.

This Tower was built 1601, for the making Aſtronomical Obſervations, near the Royal College in *Copenhagen*, and is above a hundred and fifty Foot high, whoſe *Area* at the top is ſixty Foot Diameter: The Paſſage up to it is large enough for two Coaches, and the Aſcent ſo eaſy and hardly perceivable, that it ſerv'd for a Place of Parade for their Gentry, when they had a mind to take the Air in their Coaches, riding up to the top, and ſo round the Ring, as well as for an Obſervatory.

But Monſieur *Romer* has converted the upper part of this Tower now to other Uſes, where in a dark Room he has his Inſtruments for

Obſervation. Here I ſaw his Machine for obſerving the Stars by Day: There is a Pole eight or ten Foot long, erected perpendicular in the Center of an Equinoctial Plane; on the Top of this Pole is faſten'd a Teleſcope, not much above three Foot long, which runs through the Roof of the Chamber, whoſe Elevation is directed by an Aſtronomical Dial upon the Equinoctial Plane, with an Index fitted to it for that purpoſe, which determines it to the Star he has a mind to obſerve at any time.

He is ſaid to be the Inventer of two other Machines of great Artifice and Uſe: By the one he will ſhew at any time the Station of any Planet, according to the *Copernican* Hypotheſis; by the other he will demonſtrate all the Eclipſes of Sun or Moon paſt or to come.

The Royal Throne.

There is, beſides all theſe, in the King's Houſe in the Garden at *Copenhagen*, a Royal Throne all of Unicorns Horn, on which all the Kings of *Denmark* are ſeated at their Coronation; but this, when I was there, with the reſt of the *Regalia*, was ſecured and carried away, becauſe they wou'd have been too much expoſed, had the King of *Sweden* bombarded this Town, as it was fear'd, when he landed on the Iſland, being but a little within the Wall towards the Landſide.

The Pruſſian *Knife, &c.*

In the Year 1685, I was at *Koningſberg* in *Pruſſia*, where I ſaw the Knife which was ſwallow'd by a *Pruſſian* Boor; who, being crop-ſick one Morning, thruſt the Haft of his Knife down his Throat, in order to make himſelf diſcharge what offended his Stomach; but forcing the Knife too far, it ſlipt down his Gullet into his Stomach; from whence it was taken out by an Inciſion of the left Side, a little below the ſhort Ribs, with that Succeſs, that he lived ſeveral Years after it in very good Health. This happen'd in the Year 1635. The Operation was perform'd by Dr. *Daniel Swab*, a Phyſician and Surgeon, and the Knife is kept in a Velvet Bag in the King of *Pruſſia*'s Library, where I ſaw it. I meaſured it, and found it to be of our Meaſure, but ſix Inches and about a half long, as it is expreſs'd in the Cuts given us of it. What their Authors mean, by ſaying the Knife was *decem tranſverſos digitos longum*, I don't know.

I made Enquiry concerning it, and was very well aſſured by ſeveral People of the Town the Matter of Fact was true; and 'tis hard to think, the King of *Poland*, who was then at *Koningſberg*, the Government of the City, and the College of Phyſicians, who were conſulted upon the Operation, and, together with his *Poliſh* Majeſty, were Eye-witneſſes of it, ſhou'd, by the Certificates they have publiſh'd of it in Print, contrive to impoſe a Cheat upon the World. And I remember, talking one day with one Mr. *Taylor*, a *Scotch* Merchant in *Koningſberg*, he told me, that *Andrew Grunheide* was his particular Friend and Acquaintance; that he ſaw his Wound ſeveral times when his Surgeons dreſs'd him; and was Godfather to one or two of his Children after his Recovery.

When

— Holland. *An* American *Vulture.*

When I was at *Amſterdam*, I had the Curioſity to go to a Tavern, where the Maſter was very curious in Birds, and had a great Variety of ſome very uncommon ones; amongſt which, in a Chamber by it ſelf, he ſhew'd me a Cage with a Bird in it little bigger than a Capon, which he valued as a great Rarity, and told me it coſt him near a hundred Pounds Sterling: He takes a Groat from every body that is admitted to ſee it. I muſt needs ſay I never ſaw a more beautiful Creature in all my Life; in Body ſomewhat like a Hawk, but its Head and Neck bald like a Vulture, only a few ſhort Feathers over his Eyes like Eye-brows; his Eyes were pretty large, and the *Iris* of a very fine bright Pearl-Colour, which gave a great Beauty to this Bird. The Colour of his Feathers is ſo curiouſly mixt with that Variety, that no Painter can imitate them, and entertains the Eye with a great deal of Pleaſure: His Bill and Head in Shape are more like the Eagle than the Vulture, tho' I take it to be of the kind of the latter, but of the leſſer ſort.

The Bird came from *Carthagena* in *America*, and may be deſcribed thus: *Vultur Americanus minor Carthagenæ Corpore eleganti & plumis admodum concinne variegatis.* I preſume this Bird can hardly be of the ſame kind with thoſe Vultures *Monardes* tells us of in the Iſlands near *Lima* in *Peru*, that prey'd on their living Cattle in the Fields, if not carefully watch'd by their Keepers.

I did not ſee the Cherry-ſtone in the King of *Denmark*'s Cabinet, which I was told had ſome hundreds of Heads engraved on the Outſide of it; but I remember an *Engliſh* Gentleman ſhewed me once in *Holland*, in the Year 87, a Cherry-ſtone of this kind with a hundred and twenty-four Heads on the Out-ſide of it, ſo that you might diſtinguiſh with the naked Eye Popes, Emperors, Kings and Cardinals, by their Crowns and Mitres. 'Twas bought in *Pruſſia*, where it was made, for three hundred Pounds *Engliſh*, and is now in *London*, there having been a Law-ſuit not long ſince commenc'd about it in *Chancery*. Whether this, or any artificial Curioſities before-mention'd of Ivory, *&c.* may compare with *Homer* in a Nut-ſhell; or the Ivory Ants and other ſmall Creatures ſaid to be made by *Callicrates*, whoſe Parts were ſo very ſmall, that no-body could ſee them, ſo as to diſtinguiſh one from another, but he that made them; or the Ivory Chariot made by *Mermecides*, which a Fly cover'd with his Wing, and a Ship of the ſame hid under the Wing of a Bee? And if thoſe things be true, as *Pliny* and *Solinus* tell us, whether the Ancients have not out-done us in ſuch a kind of Impertinencies, I leave others to judge.

Remarkables *in ſeveral* Parts *of* Europe, *by Mr.* C. Ellis. *n.* 286. *p.* 1416.

VIII. At *Haerlem*, *Van Dalen*, the Author *de Oraculis* ſhew'd me a Curioſity of a young Lady born deaf and dumb, yet taught by Dr. *Amman* to ſpeak very intelligibly. I heard her read *Dutch* and *Latin*; ſhe is about 17 Years old.

I was ſurpriz'd at *Amſterdam* to ſee a moſt curious *Phyſick Garden*, admirably conſtructed, and in excellent Order, which, becauſe it has more Space and foreign Plants, far exceeds *Leyden*. Here are alſo *Series Lectionum*. Our Travellers have not made much mention of theſe Things, nor any at all of *Boln*, where is a Chamber well furniſh'd with Rarities, conſidering there is no Univerſity, Schools nor Gardens, nor any Profeſſors. There occur'd here a Rarity not then publickly expos'd, two Female Children join'd together from the Neck to the Navel; their Poſture was with Arms embracing, and Legs twiſted, all Parts and Joints entire to both, the *Viſcera* too all double and perfect; the Head only ſingle, but appertaining to both, and looking over the right Shoulder of one, and the left of the other. They had been opened before I ſaw them. I could not learn by the Mother or Father, whether the *Aſpera Arteria* and *Gulæ* did not divide as they enter'd into the Stomach and Lungs, or whether they were continued ſeparate, nor any Account of the Brain: They were born alive before ſeven Months: The Father, *John Ameſton*, a *French* Soldier, but deſerted to this Place. He preſerves them with the Skin and Muſcles, by ſponging them with Spirit of Wine. He aſks 300 Guilders for them.

At *Maeſtricht* I went into the Quarry, of which there is an Account in the *Tranſactions* †; but it is more wonderful than there deſcrib'd, and more large, being three Hours in Length, and one in Breadth, and capable to ſhelter 100000 Men. It coſt me a Fit of an Ague, through its exceſſive Chilneſs. The Stone dug from hence is much like our *Kettering*; the Jeſuits have here a very fine Chapel built of it.

Franciſcus Linus's Dials at *Liege*, the Original of thoſe formerly in our *Privy-Garden*, are ſhamefully gone to decay, none remaining of Uſe, but that which diſtinguiſhes the Hours by feeling, and the Globe, which ſhews it in all other Parts of the World. Here is but one in the Society that underſtands any thing of this Matter, and he is endeavouring to make a Water-Dial, that ſhall have a Flux and Reflux like the Sea; but it is yet brought to no Perfection.

At *Namur* are no Curioſities but Military, except only the *Cachot* cut in the Rock of the Caſtle, with Apartments for 600 Men, and all Rooms of Uſe, as Kitchens, *&c.* This was done by the Order of Mareſchal *Boufflers*, to defend the Gariſon from the Bombs, and was the Labour of four Years.

At *Liege* is Sir *John Mandevil*'s Tomb, whoſe Epitaph is alſo at St. *Albans* with us, which may be hard to be reconciled.

Since my coming to *Bruxelles*, I have ſeen a young *Frieſland* Boy of about five Years old, round the Pupil of whoſe Eye they pretend is naturally engraven *Deus Meus*, and the ſame in *Hebrew*. This is look'd upon as a prodigious Miracle in theſe Parts; but upon nice ſurveying it, I could perceive it was only the *Iris* of the Eye not circularly join'd, but laſh'd out into *Fimbriæ*, which here and there might be thought to form ſome imaginary Letters; as beginning at the *Lacrymal* Corner of the left Eye, there is ſomething like D & I & V; but not a Footſtep for the ſtrongeſt Fancy to work out any more, nor any Letters of *Hebrew* in the right Eye, as they pretended. I don't doubt, but as the Boy grows up, the others may conjoin again.

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† *Vid.* ſupra, V. ii. C. iii. S. lv.

In another Letter from the *Hague*, dated *June* 16. 1699, the ſame Perſon writes, that at this Place there are very few natural Curioſities; but a Piece of Art, that of its ſort I believe never was parallel'd, which is perform'd by one *Elizabeth Pyberg*, who cuts in Paper not only Towns, as *Loo*, and *Hounſlerdyke*, but Faces to an extreme Likeneſs. She has done King *William* and Queen *Mary* better than any Limner I ever ſaw, and refuſes 1000 Guilders for the Pieces; it is ſo curious, that I could not believe the Queen's Drapery not to be Point, till I had moſt exquiſitely enquired into it.

Obſervations in a Journey *through* Italy, *by Dr.* J. P. Breynius. *n.* 334. *p.* 447.

IX. 1.] The Town of *Legborn*, ſituated in a Plain upon the Sea-ſhore, with high Hills on each Side, tho' it is not very large, is well built and fortified. The Air is not very wholſome, and I was told the double Tertian is very frequent there, and hard to be cured. From *Legborn* I went to *Piſa*, which is at ſome Miles Diſtance from it. The Road was very pleaſant, through a plain and fertile Country, with frequent Groves of Oak, Holm, Cork-Tree and Myrtle.

Piſa.

Piſa, formerly a Republick, and an elegant City, now ſubject to the Great Duke of *Tuſcany*, has loſt much of its ancient Splendor and Number of Inhabitants. There are a great many Things at *Piſa* worthy to be examined; which as they are taken notice of by other Journaliſts and Deſcribers of Places, I ſhall here paſs over in Silence. The Univerſity here was once more celebrated than it is at preſent. It has four Colleges, which are not to be compared to thoſe of *Oxford*. The firſt is called the College of *Wiſdom*; the ſecond is the College of *Ferdinand*, built by *Ferdinand* the Firſt, Great Duke of *Tuſcany* in the Year 1595. in that place where the Houſe of the famous Civilian *Bartholi* ſtood, as we find by the Inſcription; the third is the *Putean*, taking its Name from *Puteus* a Biſhop, erected in the Year 1605. The Phyſick-Garden at *Piſa*, well known amongſt the Botaniſts, was begun under *Coſmus* the Firſt, Great Duke of *Tuſcany*, in the Year 1547. ſeven years after that at *Padua*, which was the firſt, and put under the Direction of *Lucas Ghinus*, (as *Caſtellus in Opt. Med.* ſays) who was ſucceeded by *Andreas Cæſalpinus*, the beſt Botaniſt of his Age. The above-mentioned *Lucas Ghinus* is called by *Jo. Antonio Bumaldo* (under which feigned Name *Ovidius Montalbanus* lies anagramatically concealed) in his *Bibliotheca Botanica*, the firſt Founder of publick Phyſick-Gardens. But the Buildings adjacent to the Garden, in which a great many natural and artificial Curioſities are kept, were founded by *Ferdinand* the Firſt, in the Year 1595, as appears by the Inſcription over the great Gate. In the Court-yard, before you enter the Garden, you ſee a great many Bones of Whales piled up; and in the upper Part a Collection of Curioſities placed in very good Order: When you go to the other Part of the Houſe, you come to an Area of the Entry into the Garden, in the Portico of which are ſeveral Portraits fixed to the Walls, as that of *Cæſalpinus*, *Cluſius*, *Caſaubon*, *Matthiolus*, *Pona*, &c. In the upper Chambers is a large Air Pump, with ſome 137. other Phyſical Inſtruments, and Furnaces, with the Chemical Apparatus's belonging to them. The Garden is ſufficiently large, but not kept in exquiſite Order; and an old Gardener aſſured me there were fifteen thouſand different Species of Plants in it, but not diſpoſed in any regular Order. I ſaw however ſome very rare ones amongſt them, which I have not obſerved elſewhere.

The Aqueduct of *Piſa*, which conveys a very clear Water for five *Italian* Miles into the City, deſerves to be ſeen, being very old, bearing the Injuries of Time very well.

Concerning the famous bending Tower, I ſhall only obſerve this, that its Foundation on that ſide towards which it is inclined, muſt have ſunk at the Time it was a building, or ſoon after, and ſo the Tower got that Bend which has been ſo much cried up, without the Intention of the Architect, as appears very plainly upon examining it.

Lucca.

Leaving *Piſa*, I ſet out next for *Lucca*, and paſſed firſt through a fertile enough Plain, very pleaſant, with Fields ſurrounded with Mulberry Trees, Laurel, Poplar, Fig Trees, *&c.* mixed with Vines, twiſted very beautifully round them. Afterwards I travelled over *St. Julian's Mountain*, famous for Savory, high and rocky, and having but few Plants upon it. In paſſing over it, beſides the Savory, I obſerved different Species of Ciſtus, both of the Hill-roſe and the Male Ciſtus, and of the Myrtle, the Maſtic Tree, and alſo different Kinds of Heath and Houſe-leek. At the Bottom of this Mountain begins the Juriſdiction of *Lucca*, in which we preſently ſaw Olive Trees with ripe Olives, of the beſt Kind, as alſo Cheſtnut Trees, Strawberry Trees, and Turpentine Trees laden with ripe Fruits. At laſt we got into another Plain, very fertile and abounding with Vines as far as *Lucca*, the Head of a well known Republick. Here I ſaw very little remarkable relating either to Phyſick or Natural Hiſtory; I only obſerved in this Diſtrict, as alſo in *Tuſcany* a great many Fields ſown with the common white Lupins, which the People in that Country eat boiled. Beſides, there too they cultivate Vetches, Millet, Sorgh-ſeed, and Panick, both for their own Uſe, and for Pigeons and other Birds.

Florence.

From hence I travelled by way of *Piſtoria* to *Florence*, the Metropolis of *Tuſcany*. This large and beautiful Town has a great many Things in it worthy to be taken Notice of, which have been mention'd by others, eſpecially in a little Book, intituled, *Riſtretto delle Coſe più Notabili della Città di Firenze*, the Principal of which are the Treaſury of the Great Duke, which is called the *Gallery*, full of the moſt valuable Productions of Art, and the ſplendid Temple of *St. Laurence*, not yet finiſhed, deſign'd for the Burial-place of the Great Dukes, to which you may add the Great Duke's Gardens, extremely well cultivated.

The greateſt Ornaments of *Florence* at that Time were *Laurentio Bellini* and *Antonio Magliabechi*, famous all over *Europe*. The firſt, who is chief Phyſician to the Great Duke, is very well ſkill'd in Phyſick, eſpecially the Theory of it, as appears from a great many Works which he has publiſh'd, and is truly a great Man; but in Practice (which is frequently obſerv'd in others) he is not very ſucceſsful. He is a Man of difficult Acceſs, but received me with more Frankneſs than uſual. He is of a low Stature, ſixty Years of Age, broken with various Diſeaſes, and has had a Cataract of the left Eye theſe five Years bypaſt. I had a great deal of Diſcourſe with him about Phyſick. He affirmed, that there was nothing in Phyſick which might not be ſound out by Judgment and Application, (ſeeing every Thing was done by Mechanical Laws,) except the Figures of the leaſt Particles and Elements, and that this was the Reaſon why Phyſick could never arrive at Perfection. He told me that the Waters of *Tetuzzi*, ſo much cried up for curing of Diſtempers, had their Source near *Piſtoria*, and that they contained a Sea Salt, or common Salt, and had a purgative Quality; and hence he had ſometimes order'd Sea Salt diſſolved in Spring-Water to poor People in that Complaint with Succeſs, though it did not anſwer ſo well as the other. He aſſured me he had wrote a great deal, which probably would never ſee the Light; and ſaid he had applied himſelf for ſome Years by paſt to Muſick and Poetry, which he was diſtractedly fond of, being wore out with continual Study.

The other, *Antonio Magliabechi*, is Library Keeper to the *Great Duke* and his Brother the *Cardinal*. Amongſt the Phyſical Books, and thoſe of Natural Hiſtory, of which there is a great Number, there is remarkable a thick Volume very finely bound, containing very lively Figures of Plants coloured, with their Names in Writing, and entituled, *Viridarium Botanicum, in quo Arborum, Fruticum, Suffruticum, Stirpium, & plurimarum Plantarum tam indiginarum, quàm exoticarum Species lætè virentes perennantur, quas è diverſis locis collegit & delineavit, coloribus naturam imitantibus pinxit, & celebrium Botanicorum Nominibus diſtinxit* Joſephus Baldius, *Medicus, Phyſicus, Civis* Florentinus, *Academicus Apatiſta* 1650.

Amongſt the Libraries, that of *St. Laurence*, ſo call'd from an adjacent Church of the ſame Name, is not the laſt. This is no leſs remarkable an Account of its elegant Architecture, which it owes to *Michael Angelo Bonoratio*, as of its curious Manuſcripts in every Science, of which it is almoſt wholly compoſ'd, faſten'd with Iron Chains, as in the *Bodleian* Library at *Oxford*. Amongſt the Medical ones, the moſt remarkable to me ſeemed an old Folio in Vellum, with Figures expreſſed in very lively Colours, eſpecially relating to Luxations, with the following Title; *Chirurgia Hippocratis, Galeni, Oribaſii, Heliodori, Aſclepiadis Bithynii, Archigenis, Dioclis, Amyntæ, Apollonii Ther. Nymphodori, Ruffi Epheſii, Apollonii Citienſis, Sorani, Pauli Æginetæ, Palladii.* This Manuſcript, as *Magliabechi* inform'd me, was tranſcribed by *Jacobus Tollius*, ſince whoſe Death *Hainius*, Profeſſor of *Duſburg* has had it, and will publiſh it very ſoon. Here is a manuſcript Copy of *Diaſcorides*, wrote on Paper, which does not ſeem to be very old. Signior *Bruno Tozzi* carried me to the Hoſpital of *St. Mary*, ſaid to be the largeſt in *Italy*, if not in all *Europe*, in which there is a prodigious Number of ſick People, extremely well taken Care of. He ſhew'd me too the Chemical Elabatory of the Great Duke, which is called by the *Italians*, *Fondia del Grand Duca*, in which are kept a great many chemical Preparations, together with Furnaces and Utenſils. Here I obſerved the Method of preparing various odoriferous Eſſences, famous all over *Europe*, commonly called the Eſſence of *Bergamotte*, *Cedar*, &c. They are diſtilled by the Retort (not like the *Roman Eſſences*, which were prepared by Expreſſion) from Barks, with nothing but common Water, and after the Diſtillation, the Oil which ſwims at Top, called the Eſſence, is ſeparated. But the odoriferous here are uſually diſtill'd from the Flowers without the Addition of any Water, and are excellent of their kind. Beſides this Elabaratory at *Florence*, there is likewiſe the Great Duke's Diſpenſatory; in which, beſides other Rarities, there are ſome monſtrous *Fœtus's* preſerved in Spirits of Wine, as a Hare with eight Feet, a Puppy with two Feet, another with one Eye upon its Forehead, and others which were ſhewed me.

Before I leave *Florence*, I cannot paſs over in Silence the Diſgrace of this elegant Town, *viz.* the Paper Windows of a great many of the Houſes, and even of ſome of the Palaces; tho' I obſerved them ſtill more frequent at *Piſa* and *Lucca*. I am ſurprized that the Inhabitants, who in other Reſpects are really ſumptuous about their Houſes, ſhould be ſo negligent in this, eſpecially as I am perſuaded they might have Glaſs there as cheap as it is in other Places.

The thirtieth of *October* I ſet out for *Rome*, I paſſed by *Sena* famous for the Purity of the *Tuſcan* Language, and afterwards over the high Mountain *Radicoſani*, at the Bottom of which the Pope's Juriſdiction begins.

Bolſena is a Town ſituated by a Lake of the ſame Name, upon the Left of which is the high Road hard by a Foreſt of Oaks. The Oaks here are low, loaden with large Acorns, as alſo with thoſe Excrements which are the *Pilulæ capillatæ* in *Caſpar Bobinus's Pinax*, or rather of *Lobelius*, engraved by *Bedeguari*, a ſpongy muſcous Excrement. I obſerved likewiſe a great many of the Oak in *Caſpar Bobenus's Pinax*, with the large Acorn and prickly Huſk. The Mountains were very rocky, compoſed in a great many Places of Marble, with a Number of Pits, and Caverns, dug out formerly I imagine by Art.

At *Monte-Viaſconi*, a little Town ſo called from the *Muſcadine* Wine there, the moſt remarkable thing is the famous Inſcription of *Eſt*, *Eſt*, *Eſt*, concerning which *Miſſon* in his *Voyage d'Italie* has wrote the beſt; in which however, although he carps with others upon the ſame Account, he has not ſet down the Inſcription right, which I found to be as follows:

EST. EST. EST. PPR. $\overline{\text{NIUM}}$.
EST. HIC. IO. DEUC. D.
MEUS. MORTUS. EST.

Viterbo is the moſt remarkable Town after *Sena* upon this Road, pretty large, and ſubject to the Pope: On the right of which, at an *Italian* Mile's Diſtance, I heard there were the natural Baths, called *Bulicanti*, that is, boiling, which I was curious to ſee. I found them on a Declivity, in a dry, whitiſh, and as it were limey Soil, diſcovering themſelves as you approaced them by a ſulphureous Steam and Smoke. The Taſte likewiſe was ſulphureous and brackiſh. The beſt of them is ſituated a little higher than the others, compoſed of a great many Springs bubbling out of the Earth, ſurrounded with a low Stone Wall with an heptagonal Figure, and is almoſt equal in Bigneſs to the King's Bath at *Bath*. Upon one Side of the Wall is the following Inſcription cut in the Stone.

D. O. M.
Ars Ortulanorum.
fecit A. D. MDC.

The Water is very hot, ſo as to burn the Hand if it is kept for ſome Time in it, and hardens an Egg very ſoon. From this run out four little quick Stripes into the ſecond Bath, which is a great deal cooler than the firſt. The Channel of theſe Stripes is ſtony, and white from the limy Sediment of the Water, of which it is full, which appears from the Stalks of Hemp, which I gathered there, cover'd over with a ſtony limey Cruſt of the ſame kind. In many Places this cruſty Sediment is of a greeniſh Colour, and gives the Water the ſame Taint. Theſe Baths appeared to me to be almoſt quite neglected, which I was much ſurprized at, though I ſhould not adviſe the Uſe of them internally, upon account of the great Quantity of limey Particles mixed with them. However, in the ſecond Bath the Peaſants there uſually ſteep their Hemp.

Remarks *on a* MS. *&c. Vid.* ſupra, *p.* 138.

2.] *Some Remarks upon the Vellum Manuſcript above-mentioned, taken out of the Additamenta* G. Ch. Schelhammeri *ad* Herm. Conringii *Introductionem in Artem Medicam.* Cap. xii. pag. 401.

Beſides thoſe, (*viz.* Hippocrates, Galen, *and* C. Celſus) *we have none among the Ancients, who have treated on Surgery.* H. Conringius.

There remain a great many Anecdotes, if we may believe *Johannes Sponius*, famous for his Skill both in Surgery and Antiquity, in that magnificent Library of the Great Duke of *Tuſcany*; amongſt the Manuſcripts which are kept in the Church of *St. Laurence*, concerning which I ſhall tranſcribe his own Words from his Journal, where he put down what he ſaw remarkable in *Italy*, *Sclavonia*, *Greece* and *Aſia*. But when he comes to deſcribe what he ſaw extraordinary in *Florence*, he ſpeaks in his Native Language, which I have tranſlated thus: *I ſhall mention another Manuſcript belonging to the Art which I profeſs, and is the only one of the kind, as far as I know, in any Library in* Europe. *It is a very large* Greek *Volume, containing the* Surgery *of the Ancients*, Hippocrates, Galen, Aſclepiades, Bithynus, Apollonius, Archigenes, Nymphodorus, Heliodorus, Diocles, Ruffus Epheſius, *and* Apollodorus Cytienſis, *in which there are Figures repreſented on Parchment, ſhewing the Manner of reducing Luxations. Of the laſt, as alſo of* Aſclepiades, Apollonius, *and* Diocles, *there is a frequent mention made in* Pliny. Archigenes *too is mentioned ſeveral times by* Galen: *But their whole Works are no where to be found. And as to* Bithynus, Nymphodorus, *and* Heliodorus, *their Names are ſcarce known to us.* If all this was true, as *Sponius* repreſents it, it would be a great Injury done to Surgery to keep ſuch a Work concealed, in which there muſt be a great many very uſeful Obſervations. For it is plain to all the World, and agreeable to Reaſon, that there muſt have been a greater Number of good Obſervations amongſt the Ancients, when the Art of Surgery was ſtudied by Phyſicians, than there poſſibly can be now amongſt ignorant Operators, who know nothing of Anatomy.

But however, the ſlight View that *Sponius* has taken of the Manuſcript has deceived him. For as I intended to inſert theſe Obſervations, I was luckily aſſiſted by *Meibomius*'s Knowledge, my intimate Friend and Collegue, a moſt ſagacious Enquirer into Medical Antiquities, and who I know enjoyed the Benefit of peruſing the Grand Duke's Library ſo as to be envied while he ſtaid at *Florence*, which was a long Time. Aſking his Advice about this Manuſcript, he ſent me the following Anſwer.

That Book, which a certain Phyſician *Nicetas*, I know not of what Age, gathered from the ancient Surgeons, I am very well acquainted with. It ſtood upon the Shelf LXXIV in the Great Duke's *Laurence*'s Library, and I was allowed to peruſe it all the while I was at *Florence*, and to tranſcribe ſeveral Things out of it. However, it is not at *Florence* alone, as *Sponius* believes, but the ſame Collection is likewiſe extant in the King of *France*'s Library. Neither are all the Treatiſes in that Volume unpubliſh'd, nor of that Moment he repreſents them, far leſs are the Authors of them unknown. I have found in it ſome Books quite entire, and only very ſmall Fragments of others. I don't mention any thing of the Writings of *Hippocrates*, *Galen*, *Oribaſius*, *Paulus Æginета*, *Ruffus Epheſius*, and *Palladius*, which are known to be publiſh'd elſewhere. I ſhall only ſay ſomething of *Bithynus*, *Nymphodorus*, and *Heliodorus*, becauſe *Sponius* mentions their Names as quite unknown. Of *Bithynus* indeed he might not have ſaid amiſs, that he, of all the reſt, was leaſt known by Name, becauſe it lately ſprang out of *Sponius*'s Brain,. For the Fragments that are there, are of *Aſclapiades* of *Bethynia*, or *Pruſia*, ſo frequently mention'd by *Pliny* and *Galen*; and of him he makes two; one *Aſclepiades*, and the other *Bithynus*. After the ſame manner he might have divided *Ruffus Epheſius*, making one *Ruffus* and the other *Epheſius*. *Heliodorus* is mentioned both by *Ægineta* and *Oribaſius*, who commend his Surgery; and *Nymphodorus* would probably be known both to *Celſus* and *Galen*, and likewiſe *Oribaſius*, on account of his Commentary. And the ſame *Heliodorus*, of whoſe Writings there are eleven Chapters upon Fractures in that Collection, has been peruſed and publiſhed by *Vidius*. G. C. Schelhammerus.

Obſervations made about Rome *and* Naples, 1683, 1684. *by Dr.* T. Robinſon, n. 349. p. 473.

X. In my Journey from *Rome* to *Naples*, I obſerved on the Rubbiſh of the *Tre Taberne* an unuſal Vegetable for that Place, remote from Town or Houſe, which was the *Ficus Indica Spinoſa*, commonly called the *Opuntia* or *Tuna*, and by our Writers of *America*, the *Prickly Pear*, whoſe Juice gives the Urine a red Colour. When I came to *Naples*, I found it there near the Rocks, and in ſome wild ſolitary Places like a Native. If the *Spaniards* planted it, they choſe deſert Situations. On this Plant the *Cochineel Vermiculus* is ſaid to feed in great Numbers, before it changes into the *Chryſalis* or *Aurelia* of a *Lady-Cow*: But the Colour lies in the *Nymph-Worm* before it turns a *Beetle*. This gives me Occaſion to reflect upon the many Species of our *Europæan Vermiculi*, ſome of which might be found to yield rich Colours (if try'd): We are certain the Maggot of our *Ilex* gives the *Kermes*, and a noble Scarlet Dye before it turns into a Fly. Many Shell-Fiſh (which are a ſort of Inſect) contain Purple Juices.

This brings on another Remark I made in paſſing the *Appennines* and *Alps*, where I noted in ſome Beds or *Strata*, and even in the midſt of the hardeſt Rocks, great Varieties of perfect Shells, that never occurr'd to me on the *Italian* Shores, nor in any of the numerous *Muſeums* of that Country: So I gueſs they might be *Exotic*.

Going further on the *Via Appia*, I obſerved abundance of the *Siliqua Arbor*, or *Carob-Tree*, commonly call'd *Panis St. Joannis Baptiſtæ*, on the Pulp whereof many poor People were feeding. The Huſks taſted like *Manna* to me. Near them grew plenty of the *Arbor Judæ*.

The *Arbutus*, or *Strawberry-Tree*, was common in the woody Places. If this grows wild in the South-Weſt-Parts of *Ireland*, as ſome affirm, I ſhall think them much warmer than any Counties of *England*.

Before

Cork-Trees.

Before I enter'd the beautiful *Campania* of *Naples*, large Woods of *Cork-Trees* grew on each ſide the Road, where the Inhabitants were decorticating them. I aſked if the Trees did not periſh; they anſwered, ſome did; but the Acorns returned annual Supplies. The Women and Children wore Shoes made of the Bark.

Manna.

Coming near *Capua*, I obſerv'd a Species of Aſh, or *Ornus*, on the Trunk whereof many ſaccharine Concretions were viſible. This proved the true *Manna*, that iſſues out through the Inciſions made in this Tree by the Inhabitants of *Calabria*. Swarms of *Cicada's* were ſucking the Body and Boughs, and perhaps by wounding them made way for freſh *Manna*. Here I may note, that many Inſects have not only a *Proboſcis* to bore and draw out the Juices of Plants for Aliment, but other proper Inſtrumentss to convey their Eggs into Vegetables and Animals, where they may find Covert and Food when they come to hatch, in the Gall-Tumours, and other Excreſcences occaſioned by the Wounds of the Parent Inſects, that make ſuch Variety of *Cupiculi* in all Parts of Plants, and even in the cutaneous Parts of living Creatures, and in dead Fleſh.

This confirms me, that many Gums and Exudations find their Way out of Vegetables through the Wounds of Inſects and other Apertures. Moſt *Voyagers* through the *Eaſt-Indies* affirm, that *Gum-Lack* is worked and made by large *Ants* that cover the Trees. I rather think the Inſects ſuck and terebrate the Tree, and ſo give Vent to that peculiar Sap that hardens in the Sun. This may extend to moſt balſamiferous, gummiferous and ſaccharine Plants, eſpecially in hot Climates, where Inſects abound, and are more active. In cold Climates the Saps of many Vegetables will boil into Sugars, as that of Maple, Birch, Reeds, *&c.* Not but that the Fluids of Plants (like thoſe of Animals) will ſpontaneouſly break through their Veſſels in a Plethory, and make on the ſuperficial Parts various Eruptions and Congeſtions.

Diſcourſing of *Manna*, I may here take Notice there are many Adulterations of this Drug. All paſſes for the *Calabrian*, whereas that of *Brianſon* is from the *Larix*, that of *Perſia* from the *Myrica*, and theſe frequently mixt with the Juices of Spurges, and other purgative Ingredients. I muſt not here deny, that Dew will ſometimes in cool Mornings ſhoot, and congeal into a ſolid, ſweet, white Subſtance, which I once obſerved in very hot Weather before Sun-riſe.

— *of* Vulcano's.

Upon viewing the *Vulcano's* about *Naples*, *Veſuvius* on the Eaſt-ſide, the *Solfatara* and *Monte di Cinere* on the Weſt near *Puzzuolo* and *Bajæ*, I obſerved the ſame Face of Nature, which I believe runs through all the other *Vulcano's* of our Globe; *viz.* Heaps of Pumice-Stones and Cinders of *Marchaſites* on the Sides, with Beds of Flower of Brimſtone on the Tops. The Holes and Cavities in thoſe calcined Minerals ſeem to be the *Nidus* of the *Sulphur*, which hath been ſublimed by the Heat and Fire of that vaſt Maſs of *Pyrites*, that compoſe the Bowels of thoſe

Vulcano's, and lie ſcattered through many Parts of the Earth, even under the Sea, where they ſometimes germinate, ferment, and take Fire, throwing up little *Iſlands*. Earthquakes and other Shocks of the Globe may ſpring from the Mines of theſe combuſtible and exploſive Minerals, loaden with Brimſtone and elaſtic Salts. Hence ſome Account may be given of *Thermæ* or hot Baths, whoſe Waters gliding through theſe hot Beds, take their *Gas*. Of ſuch medicinal boiling Waters and Stoves, there are more about *Naples* than in any Place I ever ſaw or heard of, the whole Country being continually pervaded by hot Streams.

Palm-Trees. Walking round this City, I found *Palm-Trees*, ſome with unripe *Dates* hanging down, others without any Fruit: And there was another Species of *Palm* that ſweats out the *Gum-Dragon*. I ſuppoſe the Monks had tranſplanted them out of *Africa*. I ſaw growing here many *Sugar-Canes*, *Rice*, *Maiz*, abundance of the purging *Senna*, and *Cumming-Seed*. Through the whole *Campania* of *Naples* I obſerved the ſame Vegetables to be larger and more proud than in other Parts of *Italy*, as the *Platanus*, the *Lentiſcus*, the *Terebinthus*, the *Piſtaches*, the *Oleanders*, *Agnus Caſtus*, *Barba Jovis*, the *Tragacanth*, the *Styrax*, the *Capers*, &c. The *Melons*, *Jujubes*, the *Azaroles* and other Fruits were of a better Taſte. The *Goſſypium*, with the Cotton breaking out of the Huſks, adorn'd ſome of the Fields; the Hedges full of *Pomegranats*, *Almonds*, *Tamariſk*, *Sumach*, *Cedrus Lycia*, (a ſort of Juniper or Savin) abundance of *Phillyrea*, *Alaternus*, *Ciſti*, *Cytiſi*, *Myrtles*, *Spaniſh Broom*, *Bays*, *Lauruſtines*, &c. all wild, indigenous of that warm Soil and kind Climate. The Water-Melons, the Olives, the Oranges, Lemons and Citrons were better than about *Genoa*, or in *Provence*.

The *Lotus Arbor* or *Nettle-Tree*, the *Paliurus* or *Chriſt-Thorn*, the *Ricinus* or *Palma Chriſti*. common in the Hedges, with ſeveral *Thymelæa's*.

I ſaw them fiſhing for *Coral*, and *Hippocampi*; the firſt did not come ſoft out of the Sea; the hard Incruſtation covers the vegetable Part that bears Seed, as the *Alga's* and *Fuci* do. They take the *Sword-Fiſh* by darting a Spear into him, as they do the *Whales* in the *Greenland-*Fiſhery.

Flies, &c. When dark Night came on, I could ſee Multitudes of luminous Flies thro' the *Campania* of *Naples*: Perhaps our Male *Glow-Worm*, or flying *Cicindela*, may abound there; not but that many other Inſects may carry ſuch Lanthorns about them. The *Scorpions* creep out about that time; and I have found them often in Bed, with the *Punaiſes*.

The Hedges are full of *Lizards* of various Colours; and the *Cicada's* chirp and ſing towards Evening. I obſerved ſeveral Species of ſtinging Spiders in the Corn-Fields, ſome of which, in hot Harveſts, may prove *Tarantula's*; the Poiſon of Animals and Plants increaſing with the Approach of the Sun, and the Heats of Climates. Abundance of Silk-Worms were ſpinning on the Trees and Shrubs; the Birds prey'd upon them, before they could change into *Papilio's*, as they do upon Swarms of *Locuſts*.

I eat often their young Frogs, Tortoiſes and Snails, ſerved up with Oil and Pepper, which agreed well with me; ſo did their *Sea-Urchins*, and the *Urtica Marina*, (called *Sea-Jelly* or *Blubber*, though it be an Animal, having a true Heart, and Veſſels for the Circulation of Fluids). Some of their Thiſtles are no ungrateful Sallet.

I ſaw ſome Vitriol Works about *Siena*, *Rome* and *Puzzuolo*; thoſe of *Alum* only about *Civita Vecchia*. Amongſt the Sands of the *Adriatic* Sea I obſerved many white, clear, ſhining Flints; which they told me were carried to *Venice*, to make the fine Cryſtal Glaſs at *Muran*.

Upon reading Dr. *Muſgrave*, *de Geta Britan. & Synop. Chronolog. Dom. Sever.* I conſulted my Diary taken at *Rome*. The magnificent *Septizonium* figured by him ſtood near the Foot of the *Palatine* Hill, ou the E. S. E. ſide, overlooking the *Via Appia* and the *Circus Maximus*, the *Amphitheatre* of *Titus*, being near on the other ſide. By the Number of *Portico's*, (which were ſeven) it might contain Multitudes of People, as Spectators of the Triumphal Entries, and the publick Games. But I would not be thought to differ from him, who with good Authority thinks it the *Sepulchretum* of that Imperial Family; tho' moſt of the ancient *Mauſolæums*, (at leaſt thoſe I ſaw) were *Rotonda's*, or *Colombaria's*, for the more convenient placing the *Urns* of the Kindred; as that of *Auguſtus* near the *Campus Martius*; that of *Adrian* on the other Bank of the *Tiber*; thoſe ſaid to be of *Scipio*, of *Cicero*, and *Munatius Plancus*, near *Gaieta*, and the *Via Appia*; that of *Virgil* on the ſide of Mount *Pauſilippus*; that of *C. Metella*, and ſome others on the *Via Flaminia*, Some were Pyramidal, as that of *Ceſtius* in the Wall of *Rome*, and a few others on the publick Roads. This *Septizonium Severi* ſeems to differ from the reſt of thoſe Ancient *Sepulchretums*, which might be varied according to the Fancy and Humour of great Families.

This Urn Burial was only in Faſhion amongſt the *Gentes Majores*: As for the dead Bodies of the *Plebeians* and Slaves, they were generally laid in Places where they had dug Stone; and thoſe Quarries became *Catacombs*. The Laws prohibited them to bury within a City, unleſs the Bodies were firſt reduced to Aſhes.

I obſerv'd in many of the Ruins about *Rome* and *Naples*, great Stones laid cloſe, and wedged very faſt with little or no Cement; the Bricks towards the middle of a Building were generally of a *Rhomboidal* Figure, very ſmooth, ſhining and hard, laid in Plaiſter as firm as Marble. Their Mortar was much more durable than ours, as appears at this Day by their *Aqueducts* and *Piſcina's*, the *Cento Camare*, and *Caligula*'s Bridge under Water at *Bajæ*. *Pliny* ſays they made Uſe of the *Terra Puteolona*; but the preſent Inhabitants have loſt the Way of tempering it.

During my Abode at *Genoa*, *Leghorn*, *Oſtia*, and *Civita Vecchia*, I obſerv'd many *Torpedo's*, or *Cramp Fiſhes*, moſt accurately anatomized *Fiſhes.* by *S. Lorenſini*; Plenty of *Sphyræna's*, (a Species of Sea Pike, a-kin to the Needle-Fiſhes.) The *Uranoſcopus*, call'd *Bocca in Capo* and *Prete*. The *Mola* or Sun-Fiſh. The *Dentex* or *Pentalis*. *Altavela's*, a ſort of *Paſtinaca*. The *Peſce Baleſtra* or *Capriſcus*. The *Peſce Pettine* or *Novacula*. The *Zygæna* or Balance-Fiſh, as large as the Saw-Fiſh or moſt Sharks. The *Scolopax* or *Trombetta*, call'd by our Seamen the Bellows or Trumpet-Fiſh. The *Draco Marinus*. The Tunny-Fiſh. The *Centrina* or *Peſce Porco*. The *Aquila*. The *Scorpius Major*, with Varieties of *Turdi* in the Markets. But what pleas'd me moſt, were ſome odd Sea Animals, as the *Lepus Marinus*, (a Species of naked Snail) the *Hyſtrix Marinus*, or *Eruca*, call'd by the Seamen *Pincio*, with a Bruſh hanging out of the Tail, like the *Byſſus* or Silk of the *Pinna*. Many *Tamburo's* or Drum-Fiſhes; Plenty of *Muræna's*. I obſerv'd a ſtrange Sea Animal, call'd the *Microcoſmo marino*, with many Shells, *Tubuli* and Vegetables growing or ſticking to the Back of it. This appear'd to me a-kin to the *Echini Marini*, or rather to the *Stellæ Marinæ*, being Triangular, and ſometimes *pentadactylous*.

I embark'd once with the Fiſhermen, who ſhew'd me ſeveral *Loligo's*, *Polypi*, and *Sepia's*, or Cuttle-Fiſhes, (all *Cruſtaceous)* ſome of them were caſting out their Ink in the Water: I ſuppoſed ſome Sharks, Dog-Fiſhes, or other Enemies, were near them: This black Liquor may be the Gall of thoſe Animals. In the Nets I often found Sea Inſects, and Vegetables; and indeed a new World, undeſcrib'd by natural Writers, at leaſt unknown to me.

Birds.

I obſerv'd the *Italians* near the *Alps* and *Appennines* call'd ſeveral Birds *Francolino's*, as our Red, Grey and Black Game; and even their red and white Partridges. The different Colours of the Hens from the the Cocks, the many Variegations in Feathers, the different Ages and Places, have all given Occaſion to multiply Names and Species. The ſame may happen in Fiſhes, Quadrupeds, Inſects, and all the Diviſions of *Zoology*; and even in *Botany* and *Mineralogy*.

The *Italians* call many of their little fat Birds *Beccafigo's*, that feed upon Figs, Grapes and other ſweet Fruits. So the *French* multiply their *Ortelans*, taken in the Vineyards and Gardens. Some of the Ancient Writers take notice that the *Romans* uſed to feed their Geeſe and other Birds with Figs, when they intended to ſwell their Livers to a monſtrous Bigneſs.

The *Merop* or *Apiaſter* is common on their Brooks; it flies like our King's-Fiſher, and preys not only upon Inſects, but Fiſh. There is a very beautiful Bird in *Italy*, that ſuſpends its Neſt down from the Boughs of Trees: When I ſaw it fly by me, I took it for an *Indian*, from the Brightneſs of its Colours; it is as large as our Miſſel-Bird and Thruſh. *An Icterus Plinii?*

The great *Cock of the Wood* (ſaid to be found in *Ireland)* is common on the Sides of the *Italian* Hills, and brought frequently to the Markets. I ſaw twice or thrice the *Himantopus*, and the *Phœnicopterus* or *Flamingo*, (whoſe Tongue was a Dainty amongſt the *Romans*, when they grew luxurious.) I have obſerv'd ſome *Spoon-bills:* Theſe three laſt Birds were wading in the Rivers and Marſhes near the Sea. Once I ſpy'd ſome *Pelicans* on the *Adriatic*, near the Mouth of the *Po*, The *Avis Diomedæa* was hung up dry'd in one of the *Muſeums* at *Florence*; but they told me it had been taken on ſome of the Iſles of the *Archipelago*.

On the *Laguna* of *Venice* I ſaw ſeveral Species of *Mergi*, *Lari*, *Colymbi*, and other Water-Fowls, moſt of which div'd. I was ſurpriz'd with the Variety of them, having not ſeen ſo many on other Coaſts: Perhaps the hard Winter had forc'd ſome unuſual Birds thither. The Monks and Friars told me, they eat ſome of thoſe Sea-Birds in *Lent*, and on Faſt-Days, becauſe they liv'd upon Fiſh, and had a piſcoſe Taſte, as the *French* pretend their *Macreuſe* to have, which is a ſort of Sea-Duck, common on the Coaſt of *Normandy*, and brought to the Markets, even at *Paris*, on *Maigre* Days; of which I gave a long Hiſtory in the *Philoſ. Tranſactions* †.

Buffalo's are common in the Kingdom of *Naples*, and in ſome Parts of *Lombardy*, where they plough and draw with them. A peculiar Cheeſe is made of their Milk, (called *Caſio di Cavallo*) rowl'd up like ſtiff Pieces of Ribband. Out of their black ſhining Horns they make Snuff-Boxes and Combs. The Creature is unruly, and therefore they lead them with Iron or Braſs Rings drawn thro' their Noſes. They make a Buff Leather of their Skins. I once ſaw ſome hairy Sheep feeding on a Common; perhaps they had been brought from *Africa*.

† *Vid.* ſupra, V. ii. Ch. vi. S. lxxxv. Quadrupeds.

In paſſing the high *Alps*, I had a View of the *Ibex* or *Steinbock*, whoſe large Horns are recurvated almoſt as far back as the Tail; they are very ponderous for the Bulk of the Animal, having many knotty Rings, that may help them in climbing. They are rarely taken.

The *Rupicapra* or *Chamois* is very common on the Sides of the Cliffs, whoſe Skins afford the ſoft Leather. The *Mus Alpinus*, or *Marmota*, is as large as a Rabbet, will ſoon grow tame in Houſes, tho' brought down from the Summits of the higheſt Mountains, where it will grow fat.

I have ſeen in ſeveral Towns of *Italy* freſh ſtrong *Porcupines*, which the Inhabitants told me were taken in the Hedges and Ditches thereabouts, tho' much more rare than our Land *Urchins*. In the *Griſons* Country, and in ſome Cantons of *Switzerland*, I have often obſerv'd the *Ranunculus Viridis* or ſmall Tree-Frog, perching on the Boughs and Leaves.

In the Northern Parts of *Germany* I ſaw ſeveral *Elk* Skins, and thoſe of the *Rhin-Deer* ſtuffed, and ſet up in *Muſeum's*, but never alive; tho' the Animals are ſaid to be common in *Muſcovy* and *Lapland*, and ſometimes ſeen in the Foreſts of *Pruſſia*.

The Skins of *Hippopotami* (ſaid to be the *Behemoth*) are in ſome Collections of Curioſities in *Italy* and *Holland*; ſo are thoſe of the *Muſk-Deer*, one of which is in the *Muſeum* of our *Royal Society*.

A Journey to the Top *of the* Pike *of* Teneriſe, *&c. by Mr.* J. Edens, n. 345. p. 317.

XI. On *Tueſday Auguſt* the 13th, *N. S.* at half an hour paſt ten in the Evening, I, in company of four more *Engliſh* and one *Dutch* Man, with Horſes and Servants to carry our Proviſion, together with a Guide (wich is the ſame that has conducted all thoſe that have been this Journey for many Years) ſet forward from the Port of *Oratava*, the Night being ſomewhat cloudy, and the Moon in the full at 12 the Night following.

At half an hour paſt Eleven we came to the Town of *Oratava*, which is about two Miles from the Port, were we ſtopt for about half an hour, to get walking Staves to aſſiſt us in our aſcending the Steep of the Pike.

At one a-Clock on *Wedneſday* Morning we came to the Foot of a very ſteep Riſing, about a Mile and a half above the Town of *Oratava*, where it began to clear up; and we ſaw the Pike with a white Cloud covering the Top of it like a Cap.

At two a-Clock we came to a plain Place in the Road, which the *Spaniards* call *Dornajito en el Monte verde* (the little Trough in the green Mountain) ſo call'd I ſuppoſe becauſe a little below this Plain: On the right Hand as we went, there is a deep Hollow, at the upper End of which Hollow there is a Spout of Wood placed in a Rock, through which there runs very clear and cool Water, which comes from the Mountains; and at a Deſcent a little lower than the Spout there is a Trough into which the Water comes.

At three, after travelling a Road, which was ſometimes pretty ſmooth, and other times very rough, we came to a little wooden Croſs by the Road Side on the left Hand, which the *Spaniards* call *la Cruz de la Solera*, (the Croſs of the *Solera*). A *Solera* is a long Pole with a Hole at each End, which the *Spaniards* uſe to draw Wood with, by faſtning one End to the Wood, and the other to the Oxen. This Croſs was made with a Piece of a *Solera*, and for that Reaſon is ſo called; but why it was ſet up in this Place, I can't tell, unleſs it was becauſe ſomebody was kill'd thereabouts. At this Place we alſo ſaw the Pike before us; and altho' we had come up Hill quite from the Port, yet to our Thoughts it ſeem'd almoſt as high here as when we were there, the white Cloud ſtill hiding the greateſt part of the Sugar-loaf.

After riding about half a Mile further, we came to the Side of a Hill, which was very rough and ſteep, (the Place call'd *Caravala)* where are a great many Pine-Trees that grow on both ſides the Road for a great way both on the right Hand and the left, one of which that was cloſe to the Road on the right Hand as we went, our Guide deſir'd us to obſerve, it having a great Branch growing out, which with the Boughs that were upon it look'd like the Forepart of a Ship. And from the Likeneſs this Tree has to a Ship, I ſuppoſe the Place took its Name; for *Caravela* ſignifies an old faſhion'd Veſſel, formerly much uſed in *Spain*, ſharp before, ill ſhap'd every way, and all the Maſts ſtooping forwards; their Sails are all Mizen Sails, that is, triangular; they will lie nearer the Wind than other Sails, but are not ſo commodious to handle. Amongſt theſe Trees, not a great Height in the Air, we ſaw the Sulphur diſcharge itſelf like a Squib or Serpent made of Gunpowder, the Fire running downwards in a Stream, and the Smoak aſcending upwards from the Place where it firſt took fire; and like this we ſaw another, whilſt we lay under the Rocks the next Night at *la Stancha*, part of the Way up the Pike: But I could not obſerve whether either of them gave any Report as they diſcharged.

At three Quarters after Four we came to the Top of this high rough and ſteep Mountain, where grows a Tree which the *Spaniards* call *el Pino de la Merenda*, the Pine-Tree of the Afternoon's Meal. This is a large Tree, and is burnt at the Bottom, as having had Fires made againſt it; and in the burnt Place there iſſues out Turpentine. At a few Yards diſtance from this Tree we had a Fire made, where we ſtaid and baited our Horſes, and breakfaſted ourſelves. Theſe Hills are very ſandy, and there are a great many Rabbets which breed there; there is alſo much Sand found a great way up the Pike itſelf, and not a great way below the Foot of the Sugar-loaf, ſome of which I brought down with me.

At three Quarters after Five we ſet forwards again, and at half an Hour paſt Six came to the *Portillo*, which in *Spaniſh* ſignifies a Breach or Gap. We ſaw the Pike about two Leagues and a half before us, cover'd ſtill with a Cloud at Top; and the *Spaniards* told us we were come about two Leagues and a half from the Port.

At half an hour paſt Seven we came to *las Faldas*, that is, the Skirts of the Pike; from whence all the Way to *la Stancha*, which is about a Quarter of a Mile up from the Foot of the Pike, we rode upon little light Stones, for the moſt part not much bigger than one's Fiſt, and a great many not much broader than a Shilling: And if we kept the beaten Track which was uſed before, it was not ſo deep; but if we turn'd out of it, the Horſes went almoſt over their Feet. I lighted and made a Hole there, thinking to find how deep theſe little Stones lie, but could not find the Bottom; which makes me conclude they may cover the Ground for a great Thickneſs.

There are a great many vaſt Rocks, ſome of them two Miles or thereabouts from the Foot of the Pike, which the *Pike-Man* told us were caſt out from the Top of the Pike at the Time it was a *Vulcano*. Many of them lie in Heaps of above threeſcore Yards long; and I obſerved that the further theſe Rocks lie from the Foot of the Pike, the more like they are to the Stone of other common Rocks; but the nearer we went to the Pike, we found them more black and ſolid; and ſome of them, tho' not many, were gloſſy like Flint, and all extream heavy. Thoſe that ſhone ſo, I ſuppoſe, retain'd their natural Colour, but there are ſome that look like Droſs that comes out of a Smith's Forge, which without doubt was occaſion'd by the extream Heat of the Place they came from.

Some of theſe great Rocks were thrown out of the *Caldera* or Kettle in the Top of the Pike; and others from a Cave or Ciſtern which is a pretty way up the ſide of the Pike, and has by ſome been thought to have no Bottom.

At Nine on *Wedneſday* Morning we arrived at *la Stancha*, about a quarter of a Mile above the Foot of the Pike on the Eaſt-ſide, where are three or four large hard and ſolid black Rocks lodg'd: Under ſome of theſe we put our Horſes, and under others we lay down ourſelves to ſleep, after having refreſh'd ourſelves with a little Wine: And we had a Fire made in order to get our Dinner ready, where a Cook we took along with us both roaſted and boiled our Meat and Fowls. We ſlept here for about two Hours, then roſe again, and about Two in the Afternoon went to Dinner.

There are ſeveral Mountains that lie Eaſtward from the Pike at four or five Miles diſtance, call'd the *Malpeſes*, and one more lying a little more to the Southward call'd *la Montana de rejada*; all which were formerly *Vulcano's*, tho' not ſo great as that of the Pike, as appears by the Rocks and ſmall burnt Stones that lie near them, juſt in the ſame manner as about the Pike.

Still being at *la Stancha*, after we had dined, we laid down again to take a Nap under the Rocks as before Dinner; but not ſleeping very well, we all got up again, the reſt of them ſpending the Afternoon at Cards, *&c.* But I made it my Buſineſs to admire the Strangeneſs and Vaſtneſs of that great Body, which indeed is very wonderful, inſomuch that it's impoſſible to expreſs to one, that has never ſeen it, in what a manner that confuſed Heap of Rubbiſh lies; for it may very well be ſtyled one of the greateſt Wonders in the World. About ſix at Night we ſaw *Grand Canaria* from *la Stancha* bearing from us *E.* by *N.*

At nine at Night, after having had our Suppers, we retired to our former Lodgings, where laying Stones for our Pillows, and our Cloaks for Bed-cloaths, we endeavoured to get to ſleep; but all in vain for a great while. Some lying pretty nigh a Fire complain'd of being burnt on the one ſide, and frozen on the other, (for the Air was very cutting and ſharp) others happening to lie in a Place where there were a great many Fleas; though it be ſomething ſtrange that Fleas ſhould be found there, the Place being ſo cold in the Night. Perhaps the Goats ſometimes get under theſe Rocks, and ſo leave them; and I am inclin'd to believe it, becauſe the Guide and I found a dead Goat in a Cave at the very Top of the Pike. I ſuppoſe this Goat ſtraggling up here by Chance was benighted, and ſo finding the Cold, got into this Place for Heat, where meeting with too much of it, and a very ſtrong ſulphureous Vapour, it overcame him; for he was almoſt dry'd to Powder. Betwixt Eleven and Twelve we got to ſleep, and ſlept till One, when awaking, our Guide told us 'twas Time to prepare for our Journey. We immediately aroſe, and by half an hour paſt One we were all upon the March, and leaving our Horſes and ſome of onr Men behind, we went away. Betwixt *la Stancha* and the Top of the Pike there are two very high Mountains and the Sugar-loaf, each of which Mountains is almoſt half a Mile's walking: On the firſt of them the Rubbiſh is more ſmall, and we were apt to ſlip back as we ſtept upwards. But the uppermoſt is all compoſed of hard looſe rocky great Stones, caſt one among another in a very confuſed Order. After reſting ſeveral times, we came to the Top of the firſt Mountain, where we drank every one of us a little Wine, and eat each of us a bit of Ginger-Bread we had amongſt us. Then being pretty well refreſh'd, we ſet forwards again to aſcend the ſecond Mountain, which is higher than the firſt, but is better to walk on, becauſe of the Firmneſs of the Rocks. After we had travelled for about half an hour up the ſecond Mountain, we came within Sight of the Sugar-loaf, which before we could not ſee, by reaſon of the Interpoſition of theſe great Hills. After we were arriv'd to the Top of this ſecond Mountain, we came to a Way that was almoſt level, but bearing ſome ſmall matter up-hill; and about a Furlong further is the Foot of the Sugar-loaf, which we ſoon after came to. Then looking upon our Watches found it to be juſt three a-Clock. The Night was clear where we were, and the Moon ſhone very bright; but below over the Sea we could ſee the Clouds, which look'd like a Valley a prodigious Depth below us. We had a briſk Air, the Wind being *S. E.* by *S.* as it was for the moſt part whilſt we were upon our Journey.

Whilſt we ſat at the Foot of the Sugar-loaf, reſting and refreſhing ourſelves as before in other Places, we ſaw the Smoak break out in ſeveral Places, which at firſt look'd like little Clouds; but they ſoon vaniſh'd, others not long after coming in their room from the ſame or other Places.

We ſet forwards to aſcend the laſt and ſteepeſt Part of our Journey, *viz.* the Sugar-loaf, exactly at half an hour paſt Three; and after we had reſted twice or thrice, I left the Guide and the reſt of my Company, and ran forwards; and when I was got very nigh the Top (which was at three quarters after Three) two more of the Company deſerted, and came up about five Minutes after me; the reſt of the Company and the Guide coming up to the Top juſt at Four.

The Shape of the Top of the Pike is partly oval, the longeſt Diameter lying *N. N. W.* and *S. S. E.* and is, as nigh as I could gueſs, about 140 Yards long; the Breadth the other way being about 110. Within the Top of the Pike is a very deep Hole call'd the *Caldera* (or *Kettle)* the deepeſt Part of which lies at the *South* End: It is, I believe, 40 Yards deep, reckoning from the higheſt ſide of the Pike: But it is abundant ſhallower reckoning from the ſide oppoſite to *Garachica.*

thica. The Sides of this Kettle are very ſteep, in ſome Places as ſteep as the Deſcent on the outſide of the Sugar-loaf. At the Bottom of this Kettle we all were, where lie a great many very large Stones, ſome of them higher than our Heads. The Earth that is withinſide the Kettle, being roll'd up long and put to a Candle, will burn like Brimſtone. Several Places within ſide the Top of the Pike are burning, as on the outſide; and in ſome Places if you turn up the Stones, you will find very fine Brimſtone or Sulphur ſticking to them. At theſe Holes where the Smoak comes out, there alſo comes forth a great Heat, ſo hot that one cannot endure one's Hand there long. At the *N.* by *E.* ſide within the Top is the Cave where we found the dead Goat; in which Cave ſometimes the true Spirit of Sulphur diſtils, as they ſay; but it did not drop whilſt I was there.

The Report is falſe about the Difficulty of breathing upon the Top of this Place; for we breath'd as well as if we had been below; we eat our Breakfaſt there, and I was up in all for about two Hours and a Quarter.

Without doubt the Quickſilver would have fell very much upon this high Place, if I had had but the good Fortune to have got a couple of Barometers to try.

Before Sun roſe, I think the Air was as cold as I have known it in *England* in the ſharpeſt Froſt I ever was in; I could ſcarcely endure my Gloves off. There was a great Dew all the while we were there, till Sun-riſing, which we could find by the Wetneſs of our Cloaths; but the Sky look'd thereabouts as clear as poſſible.

A little after Sun-riſing we ſaw the Shadow of the Pike upon the Sea, reaching over the Iſland of *Gomera*; and the Shadow of the upper Part, *viz.* of the *Sugar-loaf*, we ſaw imprinted like another Pike in the Sky itſelf, which look'd very ſurprizing: But the Air being cloudy below us, we ſaw none of the other Iſlands but *Grand Canaria* and *Gomera*.

At Six on *Thurſday* Morning we came down from the Top of the *Sugar-loaf*; at Seven we came to the Ciſtern of Water which is reported to be without Bottom. This the Guide ſays is falſe; for about ſeven or eight Years ago, when there was a great *Vulcano* in this Country, the Cave was dry, and he walked all about it, and ſaid that the deepeſt part of Water, when we were there, was not above two Fathoms.

I gueſs the Cave to be in Length about 35 Yards, in Breadth about 12, and its ordinary Depth 14 Yards from Top to Bottom.

Upon the furthermoſt Side grows white Stuff, which the *Pike-man* told us was Salt-petre. There was both Ice and Snow in it when we were there; and the Ice was of a great Thickneſs, cover'd with Water about Knee deep. We let down a Bottle at the End of a String for ſome of the Water, in which we put ſome Sugar and drank it; but it was the coldeſt I ever drank in my life. The Ice vas broken juſt under the Mouth of it, where we could ſee the Stones lie at the Bottom, for it was very clear. A little to the right Hand within this Cave the Ice was riſen up in a high Heap, in the Form of a Spire Steeple, or like a Sugar-loaf; and in this Place I believe the Water comes in.

In our Way home we came by a Cave 3 or 4 Miles from the Pike, where there are a great many Skeletons and Bones of Men; and ſome ſay there are the Bones of Giants in this Cave; but we know not how many Bodies are laid here, nor how far the Cave may go.

We came home to the Port about Six o'Clock in the Evening on *Auguſt* 15. 1715. N. S.

Of the Icy Mountains *of* Switzerland, *by* W. Burnet, *Eſq*; n. 320. p. 310.

XII. After I had been at *Zurich*, I reſolved to go myſelf and ſee the Mountains of Ice in *Switzerland*. Accordingly I went to the *Grinlewald*, a Mountain two Days Journey from *Bern*. There I ſaw, between two Mountains, like a River of Ice, which divides itſelf in two Branches, and in its way from the Top of the Mountains to the Bottom ſwells in vaſt Heaps, ſome bigger than *St. Paul's* Church. The Original of which ſeems to have been this. Theſe Mountains are cover'd all the Year with Snow on their Tops; this Snow has been melted in the Summer, and has fallen to the Bottom, where the Sun never reaches. There it has frozen, which happens more eaſily to melted Snow than ordinary Water. Thus every Year it has increaſed, till it has touched the very Top. The Reaſon why the Water has always frozen, tho' the Sun in the Middle of the Mountain, and higher, ſhines upon it ſome part of the Day, is, that the melted Water goes under the Ice already form'd, and there freezes, and ſo expanding itſelf, raiſes the Ice above it, and ſometimes makes Cracks in it, that frighten the whole Neighbourhood: The Reaſon appears plainly, becauſe the upper Surface being ſolid, cannot be dilated without making great Chinks, and that with a terrible Noiſe, They told me upon the Place, that every ſeven Years the Mountain increaſes, and the next ſeven decreaſes: But I doubt their Obſervation is not exact, and I ſuſpect that they ſay it to ſeem to know ſomething that is ſingular. Beſides, there are none there that have themſelves obſerv'd it long enough, to affirm any thing of that kind certainly. If there is any Ground in that Obſervation, it ſeems to be, that in the hotteſt Summers it increaſes, and in the more moderate ones decreaſes, there being then leſs melted Snow; in which Caſe it is at preſent, as of late the Summers have been moderate. (*Vid.* ſupra, *Vol.* II. *C.* iii. *S.* lix.)

An Account of the Cape *of* Good Hope, *by Mr.* J. Maxwell. n. 310. p. 2423.

XIII. The *Cape of Good Hope*, which is part of *Monomotapa*, and the Southernmoſt Part of *Africa*, lies in the Latitude of 34 Degrees 30 Minutes South, and 16 Degrees 15 Minutes Eaſt of *London*. It was firſt, that we know of, diſcover'd by *Bartholomew Diaz*, *A. D.* 1493, under *John* II. King of *Portugal*. He gave it the Name of the

Cape of Tempeſts, becauſe of the Storms he met with there, with which 'tis not ſtrange that it is ſometimes troubled; as likewiſe with a Sea that runs very high, and makes ti ill riding at Anchor there when the Wind is at North-Weſt, ſeeing it is a Shread of Land ſtretch'd out into a vaſt Ocean on each ſide: But King *John* gave it the Name of *Bona Eſperança*, or of *Good Hope*, which it ſtill retains; becauſe that when that Cape was doubled, he had good Hopes of finding out a Way by Sea to the *Eaſt-Indies.*

Hottentots. The *Hottentots*, Natives of this Place, are a Race of Men diſtinct both from *Negroes* and *European Whites*; for their Hair is woolly, ſhort and frizled, their Noſes flat, and their Lips thick; but their Skin is naturally as white as ours, as appear'd by the *Hottentot* Child brought up by the *Dutch* in their Fort here. Their Stature is univerſally of a middle Size; they are clean Limb'd, well proportion'd, and very nimble. I never ſaw a fat Perſon among them.

They beſmear their Faces and Bodies all over with Suet, or other Oleaginous Stuff; which, together with expoſing their Bodies to a warm Sun, makes their Skin of a tawny Colour, and cauſes them to ſtink ſo, that one may ſmell them at a conſiderable diſtance to the Windward. They adorn their Hair, which is always clotted with Greaſe and Naſtineſs, like the Thrums of a Mop, with Shells, pieces of Copper, &c. Both Sexes are clad with the Skin commonly of a Sheep, but ſometimes of ſuch wild Beaſts as they happen to kill, the hairy Side outward in Summer, and inward in Winter, of which I have ſeen 'em pick and eat the Lice in the Streets. The Women wear Skins cut in Thongs about their Legs, to the Length of a great many Yards; which, when dry, with the Inſide out, look ſo like Sheeps Guts, that moſt Strangers miſtake 'em for ſuch. The Men hang their Privities in a Bag, and the Women cover theirs with a Flap or Apron made of Skin. The Women wear a Cap of Skin juſt dried and ſtitch'd together, whereas the Men commonly go bare-headed; they go barefooted; except that when they travel, they wear a piece of Skin faſten'd about their Feet. Their Weapons are Javelins, with which they are very dextrous at hitting the Mark; and Bows with poiſon'd Arrows, which kill, as I am inform'd, upon drawing Blood: But what they are envenom'd with, I could not learn. Their Houſes are Hemiſpherical, made of Mats, ſupported with Stakes, ſo low that a tall Man cannot ſtand upright in one of them. Theſe they remove upon Occaſion. as the Ancient *Nomades* did their Tents.

By all that I have ſeen and heard of them and other Nations, the are the moſt lazy and ignorant part of Mankind; there are no mai ner of Arts practiſed among them, no Plowing or Sowing; no goi to Sea, ſo much as in a Boat; no uſe of Iron or Money; no Noti of God, Providence, or of a future State; no Tradition of Creati or a Flood, no Prayers or Sacrifices, no Magical Rites; nor, in fi any Notion of any inviſible Being, capable of doing them either Good

Harm, upon the ſtricteſt Enquiry that I could make of Men of Senſe that had liv'd ſome time upon the Place; ſo that I believe their Ignorance hardly can be parallel'd. The only thing that looks like the leaſt Knowledge of any thing of this kind among 'em (in as much as I could learn) is a Cuſtom they have in Moon-ſhiney Nights of dancing in the Fields; of which if you aſk them the Reaſon, all their Anſwer is, that it is a Cuſtom of the *Hottentots*, and was ſo of their Fore-fathers; and that is all they can tell you of the Matter. Now whether it be that they rejoice in its Light, which diſpels that Darkneſs of which they are then moſt ſenſible; or whether they think it a rational Being endued with Freedom of Will, becauſe of its various Change of Forms, or for what other Reaſon I will not pretend to determine: However, as to no other thing, ſo to this do they pray or ſacrifice. Nevertheleſs ſome Voyagers have upon this ground, how truly I will not ſay, confidently writ, that they worſhipp'd the Moon; and upon Enquiry I could not find that they took ſo much, nor indeed any ſuch Notice of the Sun or Stars: Which former at leaſt one would think a People ſo groſly ignorant would pay ſome Reſpect to, if they worſhipp'd any God, that being the moſt glorious Object of their Senſes; accordingly we find it affected all Heathen Nations, as well the more Barbarous as the moſt Polite; in which ſingle Object *Macrobius* ſays all their Worſhipping center'd. Their great Ignorance, I ſuppoſe, may be in part cauſed by *Africa*'s being peopled (as is probable) by that end of it which joins to *Aſia*; ſo the more the Inhabitants ſpread themſelves towards this Southern Extream, the more they were cut off from converſing with the more civilized Part of the World. It is probable, I think, that they were propagated to this Place by the Eaſtern Coaſt of *Africa*, the Weſtern being now, and always having been, as as far as we know, inhabited by *Negroes*, from whom it is not very probable that theſe of ſo different a Colour ſhould have ſprung.

All the Reſemblance they have of Government, is, that in every Neighbourhood the Eldeſt is firſt in Order and Dignity; his Advice, as to what concerns the whole, being moſt follow'd, as having moſt Experience. The Ceremony of Marriage is perform'd among them by the eldeſt Perſon in the Company's ſprinkling the Perſons to be married with his Urine; upon which, and cutting out one of the Man's Teſticles, the Buſineſs is over. This ſeveral that liv'd in the Place affirm'd to me for a certain Truth. Being inquiſitive to know the Truth of this, I had the Curioſity to ſearch ſeveral of them; in two of which I could find but one Teſticle, they (I ſuppoſe) being married, as the reſt who had two were not: Which however ſhews the Miſtake of *Nieuhoff* and others, who aſſert, that the *Hottentots* cut out one of the Teſticles of all their Male Children as ſoon as they are born (according to *Nieuhoff*,) or at the Age of nine or ten Years (according to others,) and that, to make them the more ſwift and nimble; but w that Fancy ſhould come into their Heads, I cannot tell. When a Woman bears Twins among them, ſhe expoſes one to Death by Hunger or Cold, and nurſes the other; the Reaſon of which two laſt Cuſtoms is alledged by ſome to be the Fear they have of their Nation's growing too numerous. The Cuſtom of revenging rather than puniſhing Adultery with Death, has prevail'd among them. I was inform'd there, that they abhorr'd *Polygamy*, tho' ſome Writers aſſerted the contrary; but (perhaps) they are as well miſtaken in that, as in the Semicaſtration of all their Males. When any Perſon grows decrepid with Age, their Children, or neareſt Relations ſhut them up in their Houſes, and ſtarve them to death: They bury their Dead with the Skins they wore when alive about them.

Their Food is for the moſt part Roots, but chiefly one, by the *Dutch* call'd *Ontee*, which is roundiſh, about the bigneſs of one's little Finger, and hot in the Mouth; their Drink is Milk and Water. When they kill a Sheep, or a Cow, they eat the Guts and Garbidge, either ſlightly broil'd, or quite raw; they are great Lovers of *Tobacco* and *Brandy*, to purchaſe which from the *Dutch*, is all the Uſe they have of Money. They are not *Cannibals*.

There was a *Hottentot*, who liv'd for ſome conſiderable time in *Holland* and the *Eaſt-Indies*, and had learned to ſpeak *Dutch* and *Portugueze* very well, whom, upon his Return home, his Wife, Children, or Friends, could not endure; nor would they converſe with him, till upon reſuming his ancient Habit, Diet, and Cuſtoms, he had return'd to their way of Living.

Notwithſtanding their great Ignorance, they diſtinguiſh ſeveral of the more remarkable Stars by Names of their own impoſing: Nevertheleſs, they have no Diſtinction of Weeks, of Months. or of Years, any otherwiſe than by their *Rainy Seaſons*; for if you aſk a *Hottentot* how old he is, he anſwers ſo many *Rains*. They watch the *Elephants* where they uſe to water, whom they ſhoot in the Eye, where only they can wound them.

Beaſts. This Country produces Lions, Tygers, Elephants, Rhinoceroes, Elks, (whoſe Hoofs are here ſaid not to have that Virtue aſcrib'd to them in Northern Climates,) Leopards, wild Aſſes, of which one ſort is finely ſtreak'd with white and dark Brown; ſeveral ſorts of beautiful wild Goats, Jackalls, Baboons, Monkeys, Deer, large Cows, and large Sheep without *Horns*, with *Hair* like a Goat, inſtead of *Wool*, and with *large Tails*, but not (in as much as I have ſeen) ſo large as ſome report them, *viz.* of 25 lb. Weight, (the Fleſh however of both which, is very good;) ſmall Horſes, *&c.* Oſtriches, Pelicans, Hawks, Magpies, wild Peacocks, Cranes, Guinea-Hens, Pengwins, Flamingo's, Rock-Ducks. Partridges, Pheaſants, Geeſe, common Hens, Turkeys, and Ducks, *&c.* Here are likewiſe *Manatees*, or *Sea-Cows*; they are low, very thick, and ill-ſhaped, have very ſhort Feet, and yet are very ſwift, have no Hair but what grows about their Noſtrils, have large Teeth, but are no Enemy to Man; they are not eaſily wounded, live much in Rivers, and are very ſhy. Here are Serpents of various kinds, with which, however, they are not much infeſted. Their Soil produces moſt ſorts of Fruits and Plants that grow with us, as Grapes of ſeveral kinds, Apples, Quinces, Olives, Oranges, Apricocks, Cherries, Aloes of a great many kinds, but none (that I ſaw) of the right ſort, ſuch as *Socotra* produces, Pompions in abundance, Cabbages, *&c.* Corn, as Wheat, Barley, *&c.* of *Dutch* Cultivation. Here are likewiſe Lizards, Salamanders and Porcupines. This Place is fit to produce whatſoever is planted in it, the Soil and Climate conſpiring to its Advantage.

The *Dutch Eaſt-India* Company are ſaid to have bought this Place of the Natives; but ſeeing they have no Government, to whom, in that Caſe, could they apply themſelves? Of whom could they buy it? But if they did, they certainly had a good Bargain of it for a little Tobacco and Brandy: But the *Dutch* are not ſo very ſcrupulous as to trouble themſelves much about buying, in ſuch Caſes, what they can take by Force. Here however they have ſettled, for the Convenience of a Rendezvous for their homeward bound *Eaſt-India* Fleet; and they have poſſeſſed themſelves of the Country 60 Miles from the Place of their firſt Settlement: Beſides their principal Town in *Table Valley* (ſo call'd from a neighbouring Hill, call'd *the Table Land*, becauſe of its Figure, from whence alſo the adjoining Bay is call'd *Table Bay)* where they have a Fort, an Hoſpital, a ſupplied Church with about 300 Families; they have two other ſmall Towns in the Country, call'd *Dragenſtein* and *Stallambuſs*, inhabited for the moſt part by *French Proteſtants*, who make moſt of the Wine the Place produces, which is not inconſiderable, either for Quantity, Quality, or Variety, reſembling *French* Claret, *Rheniſh*, *Burgundy*, &c. they are about 120 Families, and have one Miniſter between both Villages, a *Dutchman* who ſpeaks *French*.

In this Place are reckon'd about 2000 Perſons fit to bear Arms, and about 600 Soldiers; no Perſon that is not in their own Service, tho' a *Dutchman*, is admitted into their Fort. They have prohibited the *Engliſh* to ſet up among them, tho' they have ſerved the uſual Time five Years in their Service, which Liberty they deny not to thoſe of any other Nation; and this I am inform'd, is their Practice in all their *Eaſt-India* Settlements: However, when any *Engliſh* Ship happens to touch here, diſabled in Maſts, Rigging, Anchors, *&c.* they ſupply them for their Money out of their Stores.

Inſtead of Cuſtoms and Exciſe, they uſe Monopolies; for the Monopolies of Wine of the Growth of the Place this Year 1706, was paid 39000 Gilders, imported Brandy 3000, and ſo of the reſt.

All the publick Payments they make, are either for the Watch, or for killing of Lions, 20 Dollars Reward being given for killing a Lion, and 10 for a Tyger. The latter they hunt; but the former they only dare attempt by Stratagem, whom they thus deſtroy: When a Lion in the Night-time gets among their Cattle, he commonly kills Lions.

kills more than he eats at that time, whither he ſeldom fails to return the next Night to eat up the reſt; but before he comes they take Care to ſet Snares about the Prey, with Muſkets ſo diſpoſed, that in coming at it, he muſt of neceſſity draw the Trickers, the Muzzles being ſo planted, as that they ſeldom miſs him; but if he be not kill'd outright, the Muſkets are ſure to feel his Fury; for he gnaws the Stocks, and imprints the Marks of his Teeth in the very Iron; and tho' they are able to go away, there they are known to watch for three or four Days to ſee who comes to look after the Execution, whom they ſet upon if they be not well aware.

A ſort of Pilgrims in the *Eaſt-Indies*, whom they call *Fouquiers*, and who often have Occaſion to travel thro' Deſarts, have a ſtrange Dexterity in killing theſe wild Beaſts; for when he ſees one of them making towards him, he faces him, kneeling on one Knee, and holds towards him a ſhort Spear in his left Hand, upon which the Beaſt making a Leap at him, pitches and fixes his Body, and then he runs down his Throat a Poniard which he carries in his Walking-ſtaff, and ſo kills him. I had the following Account concerning a Tyger from an Eye-Witneſs.

The *Colcheſter*, an *Engliſh Eaſt-India* Man, was at that time in *Rogues River* in *Bengal*; it was Night when ſeveral of the Ship's Company happen'd to be aſhoar in a Tent they had pitch'd to be merry in: Mr. *Ravenſcraft*, the ſecond Mate, had juſt put on a clean Shirt; he happen'd to be the fartheſt in the Company from the Door, with his Face oppoſite to it, when a Tyger ruſh'd in among them, ſeized him, and carried him off in ſpight of them, without having ſo much as a Squeak for his Life. I ſuppoſe the glaring of the white Shirt, affecting the Tyger the moſt ſenſibly of the Objects that were before him, made him fix upon him rather than the reſt. The next Day, upon Search, they found ſome Remnants of his Body in an adjacent Wood. When a Tyger leaps at a Man, if his firſt Aim be avoided, he never, as they ſay, makes a ſecond Attempt.

Monſoons. The Winds which blow at the *Cape of Good Hope*, are of that kind which are called *Monſoons*; for between the Beginnings of *March* and *September*, (which is their Winter) the Wind blows for the moſt part between the North and the Weſt, during which time they have not much fair Weather, from which rainy Seaſon the *Hottentots* compute their Year; but during the other half Year, the Wind generally blows between the South and the Eaſt, accompanied with very fair Weather: There often times come down from the neighbouring Hills moſt ſ den and violent Guſts of Wind upon the neighbouring Parts.

The Company's Garden, which is about 970 of my Paces long, 230 broad, is not now in that fine Order it was in during this Gov nor's Father's Time, when it was divided into four Parts; in each g abundance of the more remarkable Vegetables belonging to its co ſponding Quarter of the World; but tho' the Climate, Soil, and

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tuation are very favourable, 'tis now much neglected both in reſpect of its Plants and Walks, neither of which are extraordinary.

I met here with one *Teunis Gerbrantzen*, Maſter of a *Dutch* Ship, who in the Year 1690 was at *Terra di Natal* on the Eaſtern Coaſt of *Africa*, in the Latitude of 30 Degrees South, diſtant from the *Cape of Good Hope* about 800 Miles, where he ſaid he bought the Place for the *Dutch Eaſt-India Company* for 20000 Florins. Coaſting thence to the *Cape of Good Hope*, his Ship was caſt away; but they all got ſafe aſhore, who, to the Number of 18, ſet out by Land for the Cape, diſtant about 200 Miles, where only four of them arrived, all the reſt dying by the way, through Extremity of Hunger, Thirſt, or Heat, except two or three that were kill'd by the *Hottentots*; they met with no wild Beaſts by the way, Elephants excepted, which they ſaw in great Numbers. In the Year 1705, *Gerbrantzen* went again to *Terra di Natal*, the late King's Son then reigning, to whom he ſpake of the former Agreement with his Father. *My Father*, anſwers he, *is dead; his Skins* (i. e. *Cloaths) are buried with him in the Floor of his Houſe, which is burnt over him, and the Place is fenced in, over which none muſt paſs; and as to what he agreed to, it was for himſelf; I have nothing to ſay to it.* So *Gerbrantzen* urg'd it no farther, having no Orders concerning it from the Company. At his laſt being there, he met with an *Engliſh* Man, who was left there *A. D.* 1698; he had two *Hottentot* Wives, and Children by them, but would not return with him to *Europe*, leſt his Wives and Children ſhould be ſlain in his Abſence.

When I was at the *Cape of Good Hope*, I met with one Mr. *Kolbe*, a *Pruſſian*, who told me that the common Salt, made uſe of there by the *Dutch*, was left in hollow Places of the Earth's Surface, after the Sun had evaporated the Rain Water. The Matter of Fact ſeems to me hardly credible: But if it be ſo, I think it can hardly proceed from any other Cauſe, than the Rain's diſſolving a Salt contain'd in the Earth, which upon the Rain's being evaporated, remains in the Bottom; which is the more probable, becauſe that within five Leagues of the Fort is the Salt-Bay, which has its Name from the vaſt Quantity of Salt digged near it.

—Salt.

XIV. The firſt Letter directed to Dr. *Woodward*, is dated at *Boſton* in *New-England*. *Nov.* 17, 1712. In this the Writer gives an Account of a large Work in Manuſcript, in two Volumes in Folio, but oes not name the Author. This is a large Commentary upon ſome Paſſages in the Bible, interſpers'd with large Philoſophical Remarks, ken out of Natural Hiſtorians, and the Obſervations of himſelf and hers, more particularly as to Matters obſerved in *America*, whence entitles the Work, *Biblia Americana*. This Work Dr. *Mather*, ommends to the Patronage of ſome *Mecænas*, to promote the Pub- ation of. As a Specimen of it, he tranſcribes a Paſſage out of it, being a Note on that Paſſage in *Geneſis*, Chap. vi. ver. 4. relating to

An Extract *of Letters from Dr* C. Mather, *from* New-England. *n.* 339. *p.* 62.

to *Giants*; and confirms the Opinion of there having been, in the *Antediluvian* World, Men of very large and prodigious Statures, by the Bones and Teeth of ſome large Animals, found lately in *Albany* in *New-England*, which, for ſome Reaſons, he judges to be human, particularly a *Tooth*, brought from the Place where it was found to *New-York*, 1705, being a very large Grinder, weighing four Pounds and three Quarters, with a Bone, ſuppos'd to be a Thigh-bone, 17 Foot long. He alſo mentions another Tooth, broad and flat like a Fore-Tooth, four Fingers broad; the Bones crumble to pieces in the Air after they are dug up; they were found near a Place call'd *Cluverack*, about 30 Miles on this ſide *Albany*. He then gives the Deſcription of one, which he reſembles to the Eye-Tooth of a Man: He ſays it has four Prongs, or Roots, flat, and ſomething worn on the Top; it was ſix Inches high, wanting one eighth, as it ſtood upright on its Root, and almoſt thirteen Inches in Circumference; it weigh'd two Pounds four Ounces *Troy* Weight. There was another, near a Pound heavier, found under the Bank of *Hudſon's* River, about fifty Leagues from the Sea, a great way below the Surface of the Earth, where the Ground is of a different Colour and Subſtance from the other Ground for ſeventy-five Foot long, which they ſuppoſe to be from the rotting of the Body, to which theſe Bones and Teeth did, as he ſuppoſes, once belong. *It were to be wiſh'd he had given an exact Figure of theſe Teeth and Bones.*

Of large Bones.

Plants.

The ſecond Letter is dated *Nov.* 18, 1712, from *Boſton*, as all the following are. In this he treats of the Plants of *America*; and in the firſt Place, offers a Conjecture of his concerning the *Shittim* Wood, mentioned in the Sacred Writings to be made uſe of for the Ark, *&c.* It is ſaid to be not, as moſt other Woods, ſubject to rot: He judges that it was the black *Acacia*; that the *Gopher* Wood was the *Juniperus arbor tetragonophyllos*, frequent in the *Eaſt-Indies*, &c. He obſerves that the *Indians* often perform very great Cures with their Plants, of which there is a great Variety, differing from the *European*, which he promiſes a Catalogue and Deſcription of; and, for the preſent, inſtances in ſome. As, a Plant efficacious in curing *Inflammations*, whence, they call it *Anti-eriſypelas*; it grows plentifully in the Woods: A Chemical Oil extracted from it, taken inwardly, does Wonders in abſorbing ſcorbutick Salts. Another Plant, which goes by the Name of *Partridge-Berries*, excellent in curing the *Dropſy*; a Decoction of the Leaves, being drank ſeveral Days as a Tea, diſcharging a vaſt Quantity of Urine, as long as the Diſeaſe laſts; after which it may be drank without provoking Urine obſervably. Gouty Perſons drink with Benefit.

The Root, call'd the *Bleeding-Root*, curing the *Jaundice* in five ſix Days.

Another for *Gangreens*, of which he does not give the Name.

Another Specifick for the Bite of the *Rattle-Snake*, and another f *Quinſies*, or ſore Throats. A Plant, call'd by the *Indians* *Tattutipan*

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infallible for the *Lues Venerea*, the Root being uſed in a Decoction, and drank half a Pint; a Cataplaſm of the ſame Root, bruiſed, apply'd to the Ulcers, cures them alſo.

A Thiſtle, call'd the *Boar-Thiſtle*, very ſhort and prickly, with a large and long Root. To this they add a Root call'd the *Cancer-Root*, and a ſort of *Devil's-Bit*: A Decoction of which three Roots is a Cure for the *King's-Evil*, tho' very far gone, a ſmall Quantity being drank every Day, and the bruiſed Roots apply'd to the Scrophulous Tumors.

Birds.

The third Letter relates chiefly to the *Birds* of that Country; where, he ſays, they have many of the ſame *Species* with ours in *England*. He mentions very large wild *Turkeys*, ſome weighing 50 or 60 Pound; but the Fleſh is very tough and hard. He takes notice of a very large *Eagle* with a great Head, ſoaring very high, as all of that *Genus* do. As to the Itinerants, he takes notice of vaſt Flights of *Pigeons* coming and departing at certain Seaſons: And as to this, he has a particular Fancy of their repairing to ſome undiſcover'd Satellite, accompanying the Earth at a near Diſtance.

Of the Force *of* Imagination, &c.

The next Letter relates to *Antipathies*, and the Force of the *Imagination*. As to the firſt, he ſays, A Gentlewoman of his Neighbourhood ſwoons upon the ſeeing any one cut their Nails with a Knife; which if done with a Pair of Sciſſars, has no effect upon her. The Wiſe of a Perſon vomiting upon ſeeing her Huſband take a Vomit; the Patient that took it being not mov'd, but forced to take a freſh Emetic.

Some Hiſtories are here related of the *Maculæ Maternæ*. One particularly, of a Woman longing for Peas; but refuſing to gratify her Deſire, for fear of a ſort of Bug, with which at that time moſt of their Peas were infeſted, this Woman's Child, when born, had an Excreſcence on the Forehead reſembling one of thoſe Peas; with a black Speck, as the buggy Peas had, which after ſome time dry'd away and ſhell'd out, they fancy'd, as the Bugs are obſerv'd to leave the Huſk of the Pea.

This Letter concludes with an Account of a Stone generated under the Tongue, near the Root.

The fifth Letter gives an Account of ſome *monſtrous Births*, but nothing very obſervable.

The ſixth Letter relates the Stories of ſome Perſons that had Informations of Medicines for the Diſtempers they lay under in their Dreams.

The next relates the Cures of ſeveral Wounds in Perſons, which were judg'd mortal.

—Aſtronomical *Matters.*

The next Letter, being the firſt to Mr. *Waller*, is dated at *Boſton*, *Nov.* 24. 1712. In this he obſerves, in the firſt place, That the *Indians* have no Diviſion of Time, except by *Sleeps*, *Moons*, and *Winters*. Altho' the *Indians* have not divided or diſtinguiſh'd the Stars into Conſtellations, yet it is obſervable that they call the Stars of *Urſa major*, *Paukunawaw*, that is, the *Bear*: and this long before they had any Communication with *Europeans*. He ſays, there is a Tradition among them, that in *November* 1668, a Star appear'd below the Body of the Moon within the Horns of it. In the next place he mentions the *Evening-Glade*, firſt taken Notice by Dr. *Childrey*, to be conſtantly obſerved there in *February*, and a little before and after that Month; adding, that the Cauſe of that Appearance muſt be ſought for above the Atmoſphere. Then he gives a new Method of his own for finding the *Julian* Period, adding a Table for that purpoſe.

The next relates the Appearances of ſeveral uncommon *Rainbows* and *Mock-Suns*. On the 2d of *January*, in a clear Sky, but very cold, the Sun was from ten o'Clock, for near three Hours after, attended with four *Parbelia*, in the Midſt whereof were two Rainbows.

About ſix Weeks after this, in a Day much colder than uſed to be at that time of the Year, the Air a little hazy, a little after one of the Clock, for about half an Hour, four Mock-Suns were ſeen.

He obſerves, that theſe Appearances with them are of great Varieties, each uſually differing in ſome reſpect from the other.

A Murder *diſcover'd by a* Dream.

The next Letter has the Relation of a ſtrange Diſcovery of the Murder of a Perſon in *England*, to his Brother *Joſeph Beacon*, at that time at *Boſton*, in a Dream; the Perſon wounded appearing with the Wound on his Head; with the Atteſtations of ſeveral Perſons as to the Truth of it. The Information by the Dream was on the 2d of *May* 1687, about five of the Clock in the Morning, on the very ſame Day his Brother died at *London* of the Wounds he had received in *April* before: Of which Miſfortune his Brother *Joſeph Beacon* neither had, nor could have any Notice, till the next Communication by Shipping, towards the latter end of *June* following; when he had a Letter of his Brother's Death, and the Cauſe of it, agreeable to his Dream. The Relation ſeems to be well atteſted.

Rattle Snakes.

The following Letter treats chiefly of the *Rattle Snake*, hinting at the Occaſion of its Name, from the Rattle in its Tail, in which he ſays are ſometimes twenty of thoſe looſe Rings, though he does not come in with the Opinion, that one is added every Year. Next follow theſe Obſervations: That the more Northerly they travel, theſe Snakes are leſs numerous, as well as leſs venomous; nor, as it is ſaid are any ſeen to the North of *Merimack* River, which is about forty Miles North of *Boſton*. Here he relates a Story conſtantly affirmed by the *Indians*, that theſe Snakes frequently lie coiled at the bottom of a great Tree, with their Eyes fixed on ſome Squirrel above in the Tree; which though ſeeming by his Cries and leaping about to be in a Fright, yet at laſt runs down the Tree, and into the Jaws of the Devourer. Then he relates, that the Winter-abode of theſe Snakes is in the Cleft of inacceſſible Rocks, from whence in the Spring they come forth a ſunning themſelves, at firſt very feeble, which is their chief time of deſtroying them. At this time the *Cyſtis* or Gall-Bladder in theſe Snakes is full of an acid azure-colour'd Juice, which they ſqueeze out into a Glaſs; but it is ſo ſpirituous, that if the

Glaſs be not immediately ſtopped, it will ſoon evaporate: This Liquor therefore they mix with a convenient Quantity of powder'd Chalk, or *Indian* Meal; and uſe it as a proper Medicine againſt the venomous Bite of this Snake. Some have named it *Trochiſci Connecticotiani*, from the *Connecticot* Colony. It is obſervable, when the Summer Heats come on, the Snakes have no longer this azure Liquor in their Gall-Bladders, in which there is only found a black thick Sediment, of no known Uſe; at which time they think the foremention'd ſpirituous Juice is carried to, and lodged in their Gums, and ſo conveyed or thrown by the hollow of the Teeth into the Wound, when they bite, having received another Digeſtion, and higher Exaltation, by paſſing through ſeveral Strainers and Glands, before it arrives to the Gums. As an Inſtance of the Virulence of this Liquor, he tells us, that a Traveller killing one of theſe Snakes, ſuffered the inraged dying Viper to bite the End of his Switch, with the Laſhes of which he had diſabled him; and a Fly by chance diſturbing one of his Temples as he rode on afterwards, he rubb'd his Temple with the other End of the Switch, which, as he relates it, immediately cauſed his whole Head to ſwell to a great Exceſs; the Poiſon, as he ſuppoſes, permeating the whole Length of the Switch. He adds another Relation as to the penetrating Quality of this Poiſon: A Perſon provoking a *Rattle-Snake* to bite the Edge of a broad Ax he had in his Hand, the Colour of the ſteeled part bitten was immediately changed, and at the firſt Stroke he made with it in uſing his Ax, the ſo diſcoloured Part broke out, leaving a Gap in his Ax. But to return to the *Troches* made of the Gall, he ſays it is a Cordial Sudorific, and ſo good an Anodyne, that he knows ſome who take three or four Grains of it to compoſe them to Reſt after Travel. 'Tis good in all Fevers, eſpecially the malignant. 'Tis an infallible Remedy for Obſtructions incident to Women upon catching cold in Child-bed. Being taken in a convenient Quantity, twelve Hours before the Fit, it certainly cures a Quartan Ague. The Doſe is fourteen Grains, more or leſs, according to the Circumſtances of the Patient, in any Vehicle.

—**Thunder** *and* **Lightning.**

The next Letter treats of the Effects of *Thunder* and *Lightning* very frequent with them, which from its frequent deſtroying Animals, without any viſible Hurt on the external Parts, he compares to the *Jewiſh* Puniſhment of pouring melted Lead down the Throats of the condemn'd, which they called *Combuſtio Animæ*. Tho' he likewiſe obſerves, ſome have had their Hair ſinged with Marks on their Skin like thoſe made by ſmall Shot; ſome have had their Bones made limber like a Griſtle. The Captain of their Caſtle was found dead in his Bed after a Storm of *Lightning*, without any apparent Hurt. Here he relates a Paſſage, of which an Account has ſome time ſince been given in the *Philoſoph. Tranſact.* † but is here confirmed, That *July* 24th, 1681, a Ship, whereof one Mr. *Lad* was Maſter, about 100 Leagues from *New-England*, in Lat. 38. met with a violent Storm of *Thunder*,

† *Vid.* ſupra, V. II. C. I. S. lx. 2.

which did much damage to the Ship; at which time a bituminous Matter fell on the Ship, burning with that Violence, as not to be extinguiſh'd with Water till it was all burnt out, ſmelling ſtrongly like fired Gun-powder; and when they came to obſerve the Stars at Night, they found the Polarity or Direction of their Sea-Compaſſes to be changed, the North Point being turn'd to the South, and ſo continued to do for the reſt of the Voyage for a thouſand Leagues. He adds farther, that one of theſe Compaſſes continues to do ſo ſtill. He makes a *Query* whether this may be accounted for by Mr. *Boyle*'s Experiment of heating a Loadſtone red-hot, and by altering the Poſition in which it was cooled, he could change its Polarity. Which, ſome may ſay, might happen to this Needle, ſuppoſing it was made red-hot, and turned upon its Center in the Storm.

Earthquakes. From *Thunder* he proceeds to *Earthquakes*, which though he ſays they have not done with them the Michiefs frequent in *Sicily*, *Italy*, *&c.* yet they have had ſeveral very ſenſible and affrightning. In the Year 1663 they had ſix or ſeven violent Shakes in the Space of three Days: A Town lying on the River *Connecticut*, has had Scores of them in a Year for many Years together. The *Indians* affirm, that ſeveral Rivers have not only been ſtopt in their Courſe, and diverted, but ſome wholly ſwallowed up by *Earthquakes*. He farther adds a Paſſage out of *Joſſelin*, who dwelt in the Neigbourhood, that in the Year 1670, at a Place called *Kenebunch*, near the ſide of the River, a piece of Clay-ground was thrown up over the Tops of high Oaks, growing between it and the River, which it thereby ſtopt, and left a Hole in the Place from which it was thrown 40 Yards ſquare, *&c.* Next, as to Storms of Hail, he relates, that they have had very extraordinary ones, inſomuch that they have lain three or four Foot thick on the Ground, ſome as big as an Hen's Egg, others five times as big. He mentions, as an Accident ſometimes happening to them in the Winter, that it has rain'd plentifully, and at Night frozen ſo extremely, that the Weight of the Icicles has broken the Limbs of the Trees, and not unfrequently ſplit their Trunks. Though they have not thoſe *Hurricanes* to which the *Caribbee*-Iſlands are ſubject; yet they have had *Whirlwinds*, or Guſts, drive along a particular narrow Tract, for divers Miles together, with a Violence not to be oppoſed by any thing on Earth, that if their Towns had ſtood in the way, they muſt undoubtedly have been deſtroy'd. Of theſe, he ſays, a thick dark ſmall Cloud has aroſe, with a Pillar of Light in it, of about eight or ten Foot diameter, and paſſed along the Ground in a Tract not wider than a Street, horribly tearing up Trees by the Roots, blowing them up in the Air like Feathers, and throwing up Stones of a great Weight to a conſiderable Height in the Air, throwing down all in its Paſſage. The Noiſe this Cloud made was ſo great all the while, that the Noiſe of the Miſchiefs done by it was thereby quite drowned.

The Remainder of this Letter relates to ſome very ancient Remains, at a Place called *Ammuſkeag*, a little above the hideous Falls of *Merimack* River. There is a huge Rock in the midſt of the Stream, on the top of which are a great Number of Pits, made exactly round, like Barrels or Hogſheads of different Capacities, ſome ſo large as to hold ſeveral Tuns. The Natives know nothing of the time they were made; but the neighbouring *Indians* have been wont to hide their Proviſions in them, in their Wars with the *Maqua's*; affirming, God had cut them out for that Uſe for them. They ſeem plainly to be artificial.

In the next place, he gives an Account of a ſtrange Inſcription found on a Rock, in theſe Words: *At* Taunton, *by the Side of a Tiding-River, part in, part out of the River, there is a large Rock, on the perpendicular Side of which, next to the Stream, are ſeven or eight Lines, about ſeven or eight foot long, and about a foot wide, each of them engraven with unaccountable Characters, not like any known Character.* He has not yet been able to procure the whole, but has ſent a Copy of two of them, repreſented in *Fig.* 72.

Fig. 72.

The laſt Letter of this Collection gives a Calculation of the poſſible Increaſe of Deſcendants of *Adam:* And from this Introduction he proceeds to give an Account of ſome *Long-liv'd* Perſons there, as likewiſe of their *Fruitfulneſs*. He ſays it is no rare thing with them to have an aged Gentlewoman ſee many more than 100 of her Offſpring. He mentions one Woman that had 23 Children, of which 19 liv'd to Man's Eſtate; another that had 27; another 26, of which 21 were Sons, one whereof was Sir *William Phipps*; another 39 Children. He gives ſeveral Inſtances of Perſons living there to above 100 Years of Age. One *Clement Weaver* liv'd 110, his Wife being upwards of 100: This Man, to the laſt Year, could carry a Buſhel of Wheat to the Mill, above two Miles. He relates the Caſe of an old Man above 100, that loſt the Memory of ſeveral of the latter Years of his Life, but very well retained the Remembrance of what paſſed in his younger Days. It does not appear by any of theſe Relations, that the Perſons obſerved any Regularity or Method in their Diet, Exerciſe, or the like.

Long-liv'd Perſons, &c.

XV. I have always had a great Veneration for the Dictates of Nature, and the univerſal Traditions of Nations; for hereby many things are to be learned, for the eſtabliſhing of Religion againſt Atheiſts, and the Propagation of it amongſt Heathens: I ſhall therefore give ſome Specimens of the Knowledge of thoſe People whom we call Barbarians, Infidels, and Idolaters, which I have read in their own Books, and gather'd from the Mouths of thoſe who have been the greateſt Speakers and Preachers amongſt them.

An Account of the Bramines *in the* Indies, *&c. by Mr.* J. Marſhal. *n.* 268. *p.* 729.

Upon what Account or Grounds it is that ſome Travellers have ſtiled theſe People Polytheiſts, or Atheiſts, I cannot tell; or whether there be any ſuch People at all in the World, except ſome of the baſe common Sort in all Nations, I much queſtion. It is very obſervable here, that their Prieſts, or *Bramines*, and holy Men, whom they call *Jogees*, when they nave occaſion to write any thing, they always put a Figure of one in the firſt place, to ſhew, as they ſay, that they acknowledge but one God, whom they ſay is *Burme*, that is, immaterial. When they preach to the People, and inſtruct them, which is commonly every Feaſt-day, Full Moon, or the time of an Eclipſe of either Luminary, they tell the common People much of God, Heaven and Hell, but very imperfectly, obſcurely and myſtically. They ſay, that when God thought of making the World, he made it in a Minute.

They account this World the Body of God; for all that, they ſay he's Immaterial; and ſay that the higheſt Heavens are his Head, the Fire his Mouth, the Air his Breath and Breaſt, the Water his Seed, and the Earth and the Foundations thereof his Legs and Feet: but aſſert in general, that God is the Life of every Thing, yet is the Thing neither greater nor leſs for him.

They hold that God dwelt in a Vacuity before that he created the World; and that as he dwelt in that Vacuity, he created ſeveral Beings out of himſelf; the firſt were Angels, the ſecond Souls, the third Spirits, all differing in degrees of Purity, the firſt being more pure than the ſecond, and the ſecond than the third. The Angels, they ſay, neither act Good nor Evil; the Souls, either Good or Evil; but the Spirits, or *Dewta's*, as they call them, act ſcarce any thing but Evil.

They have a good Opinion of the Angels, and think their State mighty happy, hoping that when they die they ſhall be made Partakers of the ſame Bliſs and Pleaſure.

They believe that every thing that hath Life hath a Soul, but eſpecially Man; ahd they accordingly affirm, that as theſe Souls behaved themſelves in their pre-exiſtent State, ſo are their Actions in this World either good or bad by a ſort of fatal Neceſſity, which is very hard to conquer, or to overcome. Hence it is, ſay they, that there are ſo many different Humours and Diſpoſitions of Men; for their Souls, before their Entrance into their Bodies, being tainted with different Affections, cauſes the like Differences in the Parties, whoſe Bodies are their Vehicles. So that if a Man happen to have a ſudden or unfortunate Death, they immediately aſcribe the ſame to the Party's own Wickedneſs, or the bad Life that his Soul led before it enter'd into his Body: For, ſay they, the afore-acted Evil, that his Soul did in its other Life, brought theſe Accidents upon him, by getting the upper-hand of him, and by being too powerful and ſtrong. And thoſe that die thus, they believe that their Souls turn immediately into Devils. They maintain *Pythagoras's* Tranſmigration or *Metempſycoſis*, but in a groſſer Senſe than he did. For they believe that Mens Souls that have not lived ſo well as they ought, go, as ſoon as the Body dies, not only into Birds and Beaſts, but even into the baſeſt Reptiles, Inſects and Plants, where they ſuffer a ſtrong ſort of Purgation to expiate their former Crimes: But as for the Souls of the *Jogees*, or

Fucbe's,

Fuchè's, that is, of religious Men and Saints, they fancy that they go and inhabit with the good *Dewta's*, or Angels, amongſt the Stars.

As for the Spirits, or inferior Angels, they believe that they are very evil, and have a hand in all Wickedneſſes, Murders, Wars, Storms and Tempeſts; ſo that when they ſolemnize the Funerals of thoſe that are dead, they always preſent Diſhes of Meat, as Offerings unto thoſe Spirits, and ſometimes ſacrifice unto them, that they may not hurt the Souls of the Dead.

As they acknowledge the Being of a mighty God, ſo they hold that he created the World, and every thing therein. They believe that there are almoſt infinite Number of Worlds, and that God has oftentimes annihilated and re-created the ſame. But how he came firſt to create the World and Mankind, they relate to have been thus: — Once on a time (ſay they) as he was ſet in Eternity, it came into his Mind to make ſomething, and immediately, no ſooner had he thought the ſame, but that the ſame Minute was a perfect beautiful Woman preſent immediately before him, which he called *Adea Suktee*, that is, the firſt Woman. Then this Figure put into his Mind the Figure of a Man; which he had no ſooner conceived in his Mind, but that he alſo ſtarted up, and preſented himſelf before him; this he called *Manapuiſe*, that is, the firſt Man. Then upon a Reflection of theſe things, he reſolved further to create ſeveral Places for them to abide in; and accordingly aſſuming a ſubtil Body, he breathed in a Minute the whole Univerſe, aud every thing therein, from the leaſt to the greateſt.

They conſtantly believe that the Univerſe cannot poſſibly laſt longer than 71 *Joogs*, which is a Meaſure of Time with them, and is . . . . Years. Which when it is come, God does not only annihilate the whole Univerſe, but even every thing elſe, as well Angels, Souls and Spirits, as inferior Creatures; and then he remains in the ſame State that he was in before the Creation: But ſay, that after he has a while reſpired thus, he breathes again, and every thing is created afreſh, as well Angels and Souls, as all other things; but as for the Spirits, they are no more thought of. Yet for all this, after 71 *Joogs* more, all is annihilated again. How many *Joogs* are paſs'd ſince the World was laſt created, they cannot certainly tell; only it is obſervable, that in an Almanack of theirs, written in the *Sanſcript* Language in 1670, they make the World then 3892771 Years old from its laſt Creation.

The *Bramines* of *Perſia* tell certain long Stories of a great Giant that was led into a moſt delicate Garden, which upon certain Conditions ſhould be his own for ever. But one Evening, in a cool Shade, one of the wicked *Dewta's*, or Spirits, came to him, and tempted him with vaſt Sums of Gold, and all the moſt pecious Jewels that can be imagined; but he courageouſly withſtood that Temptation, as not knowing what Value or Uſe they were of: But at length this wicked *Dewta* brought to him a fair Woman, who ſo charmed him, that for her ſake he moſt willingly broke all his Conditions, and thereupon was turned out.

They tell a great many Stories, abſurd and ridiculous enough, of the firſt Ages of this preſent World, which would be too tedious to take notice of; only I ſhall here give you out of one of their own Books, what they tell us, of a great Flood that formerly happened. They ſay, that about 21000 Years ago, the Sea overwhelmed and drowned the whole Earth, except one great Hill, far to the Northwards, called *Bindd*, and that there fled thither only one Woman and ſeven Men, the Names of whom were, *Deboolab*, *Sunnuk*, *Sunnaud*, *Trilleek*, *Sannotab*, *Cuppyloſhaw*, *Suraſchab*, and *Burroopung*. Theſe, underſtanding out of their Books that ſuch a Flood would come, and was then actually coming, prepared againſt the ſame, and repaired thither; to which Place alſo went two of all Sorts of Creatures, Herbs, Trees and Graſſes, and of every thing that had Life, to the Number in all of 1,800,000 living Souls. This Flood (ſay they) laſted 120 Years, 5 Months, and 5 Days: After which time all thoſe Creatures, that were thus preſerved, deſcended down again, and repleniſhed the Earth. But as for the ſeven Men and Woman, only one of them came down with her, and dwelt at the Foot of the Mountain; the other ſix turned *Fuchees*, or holy Men, and ſpent there the Remainder of their Days.

They hold in general the *Ptolemaic* Syſtem of the Univerſe, and ſay that there are eight or nine Heavens, counting the Air and Earth, every one exceeding another in Beauty and Glory.

Their Religion conſiſts of nothing that I could ever ſee or learn, but the leading of a pure Life, the waſhing away of their Sins in the River *Ganges*, their muttering over of divers Prayers, and their doing of ſtrange and incredible Penances.

They ſay, that God is ſuch a one, that whoſoever ſeeks him, let it be after what Manner he pleaſes, whether by thinking that the Sun is he, or the Moon, or the like, if they do it but ſincerely and honeſtly, with a right affected Heart, they ſhall be received of him.

They report, that on a time a *Muſſulman* ſeeing a *Hindoo* or Pagan Prieſt in Heaven, he aſk'd God how that Infidel came to have Admittance thither, whom *Mahomet* ſo often calls by the Name of *Bitter Roots*. To whom God anſwer'd, What, if a bitter Root bring forth ſweeter Fruit than any of you, why ſhould I not receive it? Upon which the *Muſſulman* had no more to ſay.

They hold, that ſuch as ſuffer not their Minds to wander after the Luſts of the World are perfect *Jogees*, or Saints, and hold, that God is always preſent with them in all their Actions.

It is to be found in many of their Books, that there was a Time a good while ago, in which God took upon him the Shape of a Man, and ſpent many Years in reforming the World, and giving better Rules to walk by than had been before: But at length having left them, they ſoon forgot him and his Rules, and return'd to their former Courſes; upon which he told them, that he would leave them to their Ways, and never undertake any ſuch thing again.

The Religious at ſome certain Seaſons of the Year come unto the River *Ganges* (which they call the Holy River) in vaſt Multitudes, even from many Parts of *Tartary*, to waſh away their Sins, and make Expiation for their Faults.

This *Ganges* is a delicate fine River, chiefly for the ſake of its moſt ſweet, pure, and clear Waters, which have got it the greateſt Eſteem of any River in the Eaſt. I have oftentimes ſailed many Miles up it, and have found it in ſome Places not to be above a Mile broad, in others not half ſo much, and in one or two Places not above one eighth of a Mile. In *April*, when the Water is at the loweſt, it is almoſt dry in many Places; but when it is at the higheſt, which is commonly about the middle of *September*, it is very deep, and many Miles broad.

When the People are here gathered together, they have a great many ſtrange Cuſtoms and Ceremonies, and pay a kind of divine Honour and Worſhip to the River, too long to mention. The *Hindoos* and *Bramines* preach then every Day to the People, teaching them their Duties, and ordering them to ſay ſuch and ſuch Prayers; but above all things to be charitable to the Poor and Needy.

It is reported, that upon the Hills by *Caſmere* there are Men that live ſome hundreds of Years, and can hold their Breaths, and lie in Trances for ſeveral Years together, if they be but kept warm; and that every Year ſome of them come down unto the People at *Ganges*, and do many great Cures; for whom they have ſuch a Veneration, that they frequently drink the Water they waſh their ſweaty Feet in.

The Penances and Auſterities that they undergo are almoſt incredible: Moſt of them, through their continual Faſtings, and lying upon the parching hot Sand in the Heat of the Sun, are ſo lean, dry'd and wither'd, that they look like Skeletons or Shadows, and one can ſcarce perceive them to breathe, or feel their Pulſe beat.

When any great Man dies amongſt them, but eſpecially any of their *Jogees*, or Saints, they make great Preparations for their Funeral; the Corpſe is laid on its Belly, and Salt and Rice laid round about it at every corner on the ground. Then the neareſt Relations to the Party deceaſed carry a Pot of Water on their Shoulders ſeveral times about the Funeral-Pile, when they burn them; then breaking it in pieces, ſpill the Water. Which Ceremony being ended, the Pile is fired, and then all the Relations begin to howl, and embrace one another; then waſhing themſelves in ſome neighbouring River, they depart every one to his Home; and as for the remaining Aſhes, if he be rich, they gather them up, and caſt them into the *Ganges*, or the Sea.

Sometimes it happens that the Wife of the deceaſed Party, if ſhe have no Children, and be old, or ill to live in the World, will burn herſelf with the dead Body; but this happens very ſeldom. It is ſaid, that in ſuch Caſes the *Bramines* give the Woman a ſtupifying Liquor, which by the time that they are in the Fire makes them ſenſeleſs of any Pain.

To know into what Body the Soul of the deceaſed is tranſmigrated, they do thus: They ſtrew the Aſhes of the Dead upon the Place where he was firſt laid after his Death, and Handfuls of odoriferous Flowers about the ſame; and returning again in 44 Hours, they judge, by ſome pretended Impreſſion or other in the Aſhes, into what Body it is gone. If the Foot of an Horſe, or Dog, or Ox, or ſuch like, appear, then they certainly give out that it is gone into ſuch like Creatures; but if nothing appear, then they think it is certainly gone to the ſtarry Regions.

As for their Learning and Knowledge, it is but little. They have indeed ſeveral Books writ in divers Languages; but they contain nothing but a great deal of Stuff and Cant about their Worſhip, Rites and Ceremonies.

They are ignorant of all Parts of the World but their own: They wonder much at us, that will take ſo much Care and Pains, and run thro' ſo many Dangers both by Sea and Land, only, as they ſay, to uphold and nouriſh Pride and Luxury. For, ſay they, every Country in the whole World is ſufficiently endow'd by Nature with every thing that is neceſſary for the Life of Man, and that therefore it is Madneſs to ſeek for, or deſire, that which is needleſs and unneceſſary.

The laſt time that I was at *Moduſſerpore* in *Indoſtan*, I had a great deal of Talk with a *Bramine* ſomewhat more learned than any of the reſt; his Name was *Ramnaunt*; he told me a great many Secrets in Phyſick, and told me many Traditions and Stories. He ſays, that if you bury a Piece of Money for ſome conſiderable time in the Mouth of a live Frog, and then dig it up again at Midnight, that this Piece of Money, to whomſoever you give or pay it, will always return to you again.

He ſays, that if the little Worm in the Wood *Lukerakera* be cut in two, and the one Part ſtirs, and the other not; if the ſtirring Part be bruiſed, and given with half a Beetle to a Man, the other half to a Woman, this Charm will keep them from ever lying abſent one from the other.

They have Books full of the like Abſurdities, and cabaliſtic Complication of Figures: As for Example, if you write theſe following Numbers, 28, 35, 2, 7. ——6, 3, 32, 31. ——34, 29, 8, 1. ——4, 5, 30, 33. in the Squares of a ſquare Figure, and your Enemy's Name under it, and wear it always about you, your Enemy ſhall never be able to hurt you.

So if you write the following Figures in the like manner upon the Left-hand, 2, 9, 2, 7. —— 6, 3, 6, 5. —— 8, 3, 8, 1. —— 4, 5, 4, 7. —— with Turmeric, and waſh the ſame off with fair Water of *Ganges*, and drink it, it will cure all manner of venomous Bitings.

Many ſuch like ridiculous Fancies they have; all which they ſeem to have borrow'd from the *Cabala* of the *Saracens*, which is full of ſuch like.

I lately heard a *Bramine* ſay, that if ſome of the Pieces or Knots of the Cloth (in which a Woman hath been burnt with her Huſband) be ſaved, and made up in the Form of a Wick, and fitted for a Lamp, and lighted, and ſet in a dead Woman's Skull, that it would make the dead Party appear. This he ſaid he had done; but I did not believe him.

When they have any mad Men amongſt them, they take them and put them into a cloſe Room, juſt big enough to hold them, and almoſt ſmoke them to death with Muſk and cold Smells, which ſoon brings their Brains into their right Temperature, and ſo recovers them, *&c.*

Tornadoes.

There happened two things in our Voyage hither, which I thought very obſervable. The firſt was, that all our Tornadoes brought much Rain with a Stink; and if the Seamen did but lay their Cloaths by for 24 Hours, they became all full of little Maggots. The ſecond is, when we came out of *Europe*, we took in ſome Water at *St. Jago's*; and when we were almoſt at our Journey's End, our Cooper going with a Candle to open one of the Caſks, he had no ſooner done it, but the Water immediately took fire and burnt his Face, Hands and Fingers; but he ſuddenly turning about, quench'd the ſame, by ſetting his Breech on it. It ſtunk pretty much alſo at the ſame time, but afterwards came to its native Sweetneſs, *&c.*

Water ſtinking, *and recovering its* Sweetneſs.
Vid. ſupra, Vol. iii. p. 547.

An Account *of the Iſland of* Chuſan *in* China, *&c. by Mr.* J. Cuningham, *n.*280.*p.*1201.

XVI. We arrived at the Iſland of *Borneo* on the 17th of *July*, where we ſtaid but two Days, the Seaſon of the Year being ſo far paſt; and from thence made the beſt of our way through the Streights of *Banca* with favourable Winds and Weather, till we came on the Coaſt of *China* the 13th of *Auguſt*: Then we had variable Winds, which carried us abreaſt of *Emuy* the 19th following, at which time the North-Eaſt Winds ſetting in freſh, put us in great fears of loſing our Paſſage; whereupon we were forced to turn it up againſt Wind and Current all the way, the Weather ſo favouring us, that we were never but by our Topſails, elſe we ſhould have loſt more Ground in one Day, than we could have gain'd in eight. The laſt of *Auguſt* we came to an Anchor under the *Crocodile* Iſlands, both to ſhelter us from the bad Weather, (which is generally expected on this Coaſt at new and full Moon, and has been fatal to a great many Ships) and alſo to look for freſh Water, which was now grown ſcarce with us, not having recruited ſince we came from the *Cape of Good Hope*: Theſe are three ſmall Iſlands lying in the Latitude of twenty-ſix Degrees, about ſix Leagues from the River of *Hockſieu*; on *two* whereof we found very good freſh Water, with a convenient Watering-place on the South-Weſt-ſide of the innermoſt of the *three*; and by the Aſſiſtance of a few *Chineſe* Fiſher-men we procured ſome freſh Proviſions from the main Land, becauſe we did not reckon it ſafe to adventure ourſelves thither, leſt we ſhould have been brought into Trouble by the Government

vernment there. While we lay here, on the 5th of *September* we had a ſudden ſhort Shift of the Monſoon to S. W. the Fury whereof others felt, in coming upon the Coaſt of *China* at the ſame time. The 8th of *September* we put to Sea again, turning to Windward Night and Day without all the Iſlands, which are very numerous along this Coaſt, to which we were altogether Strangers beyond *Emuy*; and the Hydrography thereof is hitherto ſo imperfect, that there was no truſting to our Draughts, which made our Navigation ſomewhat more dangerous: However, on the firſt of *October* we got into the Latitude of 30 Degrees, where we came to an Anchor near the Land, until we found the way by Boat to *Chuſan*, about 12 Leagues within the Iſlands; from whence we had a Pilot, who carried us ſafely thither on the 11th of *October*. Upon this Iſland the *Chineſe* have granted us a Settlement, and Liberty of Trade, but not to *Ning-po*, which is ſix or eight Hours ſail to the Weſtward, all the way amongſt Iſlands. This being the largeſt, is eight or nine Leagues in Length from Eaſt to Weſt, and four or five Leagues in Breadth, about three Leagues from that Point of the Main-Land called Cape *Liampo* by the *Portugueſe*, but *Khi-tu* by the *Chineſe*. At the Weſt-End of this Iſland is the Harbour, very ſafe and convenient, where the Ships ride within Call of the Factory, which is built cloſe by the Shore on a low plain Valley, with near 200 Houſes about it for the Benefit of Trade, inhabited by Men, whoſe Jealouſy has not as yet permitted them to let their Wives dwell here; for the Town where they are, is three quarters of a Mile further from the Shore, environ'd with a fine Stone-Wall, about three Miles in Circumference, mounted with 22 ſquare Baſtions placed at irregular Diſtances, beſides four great Gates, on which are planted a few old Iron Guns, ſeldom or never uſed: The Houſes within are very meanly built. Here the *Chumpeen* or Governor of the Iſland lives, and betwixt three or four thouſand beggarly Inhabitants, moſt part Soldiers and Fiſhermen; for the Trade of this Place being newly granted, has not as yet brought any conſiderable Merchants hither. The Iſland in general abounds with all Sorts of Proviſions, ſuch as Cows, Buffalo's, Goats, Deer, Hogs wild and tame, Geeſe, Ducks and Hens; Rice, Wheat, Calavances, Coleworts, Turnips, Potatoes, Carrots, Beets and Spinach: But for Merchandize there's none but what comes from *Ning-po*, *Hancheu*, *Nankin*, and the Inland-Towns. Here alſo the Tea grows in great Plenty on the Tops of the Hills; but it is not in that Eſteem with what grows on more mountainous Iſlands. Although this Iſland is pretty well ſtored with People, yet it is far from what it was in *F. Martinius*'s Time, when he deſcribes *Cheuxan*. And this puts me in mind, that the ſuperſtitious Pilgrimages thereto, mention'd by him, muſt be meant of the Iſland *Pau-to*, which lies nine Leagues from hence, and three Miles to the Eaſtward of this Iſland; whither the Emperor deſign'd to go and worſhip (on his Birthday, and in the fortieth Year of his Reign) in an ancient Pagode there, famous for Sanctity, having ſent one of his *Bonzes* thither to get all things in order. But after all things were prepared there for his Reception, he was diſſuaded from his purpoſe by ſome of his *Mandarins*, who made him believe that the terrible Thunder there was very dangerous. This *Pou-to* is a ſmall Iſland, about five Leagues round, at the Eaſt-End of this Iſland, famous for the ſuperſtitious Pilgrimages made thither for the Space of eleven hundred Years: It is inhabited only by *Bonzes*, to the Number of three thouſand, all of the Sect call'd *Hoſhang*, or unmarried *Bonzes*, who live a *Pythagorean* Life; and there they have built four hundred Pagodes, two whereof are conſiderable for their Greatneſs and Finery, being lately cover'd with green and yellow Tiles brought from the Emperor's Palace at *Nankin*, and inwardly adorn'd with ſtately Idols finely grav'd and gilded, the chief whereof is the Idol *Quon-em*. To theſe two great Pagodes belong two chief Prieſts, who govern all the reſt. They have ſeveral Ways and Avenues cut through the Iſland, ſome whereof are paved with Flag-ſtones, and overſhaded with Trees planted on each Side. Their Dwellings are the beſt I have yet ſeen in theſe Parts; all which are maintain'd by charitable Devotions; and the Junks which go from *Ning-po* and this Place to *Japan*, touch there both going and coming, to make their Offerings for their good Succeſs. There is another Iſland called *Kimtong*, five Leagues hence in the way to *Ning-po*, whither, they ſay, do retire a great many *Mandarins* to live a quiet Life after they have given over their Employments: On that Iſland alſo are ſaid to be *Silver Mines*, but prohibited to be open'd. The reſt of the circumjacent Iſlands are either deſart, or meanly inhabited by a few fiſhing People, but all of them ſtored with abundance of Deer; for it is not long ſince this Iſland of *Chuſan* began to be peopled. 'Tis true, in *Martini*'s days, about fifty Years ago, it was very populous for the Space of three or four Years, at which time the Fury of the *Tartarian* Conqueſt was ſo great, that they left it deſolate, not ſparing ſo much as the Mulberry-Trees (for then they made a great deal of Raw-Silk here;) and in this Condition it continued till about eighteen Years ago, that the Walls of the Fort or Town, which now is, were built by the Governor *Ting-hai*, for a Gariſon to expel ſome Pirates, who had taken Shelter here. About fourteen Years ago, the Iſland beginning to be peopled, there was a *Chumpeen* or General ſent to govern it for three Years, to whom ſucceeded the late *Chumpeen* (who procured the opening of this Port to Strangers) whoſe Government continued till *April* 1701, being tranſlated to be *Chumpeen* of *Tiencing Wei* near to *Pekin*, and was ſucceeded by the preſent *Chumpeen*, who is Son to the old *Chunkoon* of *Emui*.

They have no Arts or Manufactories here, but making of lacker'd Ware, a particular Account whereof I cannot as yet ſend. They begin to plant Mulberry-Trees, to breed up Worms for the Production of Raw-Silk; and they make ſome Tea, but chiefly for their own Uſe.

Of Tea.

The three Sorts of *Tea* commonly carried to *England* are all from the ſame Plant, only the Seaſon of the Year, and the Soil makes the difference. The *Bohe* (or *Voüi*, ſo call'd of ſome Mountains in the Province of *Fokien*, where it is chiefly made) is the very firſt Bud, gather'd in the beginning of *March*, and dried in the Shade. The *Bing*-Tea is the ſecond Growth in *April*: And *Singlo* the laſt in *May* and *June*, both dried a little in *Tatches* or Pans over the Fire. The Tea-Shrub being an Ever-green, is in Flower from *October* to *January*, and the Seed is ripe in *September* and *Octorber* following, ſo that one may gather both Flowers and Seed at the ſame time; but for one freſh and full Seed, there are an hundred naught. Theſe make up the two ſorts of Fruit in *Le Compte*'s Deſcription of Tea: As for his other Sort, which he calls ſlymic Peaſe, they were nothing but the young Buds of the Flowers not yet open. Its Seed-Veſſels are really *tricapſular*, each *Capſula* containing one Nut or Seed; and although two or one *Capſula* only comes to Perfection, yet the *Veſtigia* of the reſt may be diſcern'd. It grows in a dry gravelly Soil, on the Sides of Hills, in ſeveral Places of this Iſland, without any Cultivation.

Le Compte is miſtaken in ſaying (*pag.* 96.) that the *Chineſe* are wholly Strangers to the Art of grafting; for I have ſeen a great many of his paradoxical Tallow-Trees ingrafted here, beſides ſome other Trees. When they ingraft, they do not ſlit the Stock as we do, but cut a ſmall Slice off the outſide of the Stock, to which they apply the Graft (being cut ſloping on one ſide, agreeable to the Slice cut from the Stock,) bringing up the Bark of the Slice upon the outſide of the Graft, they tie all together, covering with Straw and Mud, as we do.

The Commentator on *Magalhen* ſeems doubtful in the Length of the *Chineſe Che* or Cubit. Here they have two Sorts; one of 13 $\frac{7}{10}$ *Engliſh* Inches, which the Merchants commonly uſe: The other is of eleven Inches uſed by Carpenters, and alſo in Geographical Meaſures.

Albeit *F. Martini* is cenſured by *F. Magalhen* for ſpelling a great many *Chineſe* Words with *ng*, which the *Portugueſe* and others have done with *m*; yet his Way is more agreeable to the *Engliſh* Pronunciation, only in ſome Words the *g* may be left out, as in *Pekin*, *Nankin*, &c.

Having made Enquiry about *Martin*'s Account of ſowing their Fields at *Ven-cheu* with Oyſter-ſhells, to make new ones grow; I was told, that after they have taken out the Oyſters, they ſprinkle the Shells with Urine; then putting them into the Water again, there grow new Oyſters on the foreſaid Shells.

Martini ſays he could never find a *Latin* Name for the *Fula Mogorin* of the *Portugueſe*: I'm ſure it is the ſame with the *Syringa Arabica Flore peno albo in Parkinſon.* He ſays alſo, that the *Kieu-yeu* or Tallow-Tree bears a white Flower like a Cherry-Tree; but all that I have ſeen here bears a Spike of ſmall yellow Flowers like the *Julus* of a *Salix*.

The Bean or *Mandarin* Broth, ſo frequently mention'd in the *Dutch* Embaſſy, and other Authors, is only an Emulſion made of the Seed of *Seſamum* and hot Water.

Their chief Employments here are Fiſhing and Agriculture.

Fiſhing. In fiſhing they uſe ſeveral ſorts of Nets and Lines as we do; but becauſe they have large Banks of Mud in ſome Places, the Fiſherman, to go more eaſily thereon, has contriv'd a ſmall Frame about three or four Foot long, not much larger than a Hen-Trough, elevated a little at each end; in which he reſts upon one Knee, leaning his Arms on a croſs Stick, raiſed ſo high as his Breaſt, and putting out the other Foot often upon the Mud, he puſhes forward his Frame thereon, and ſo carries himſelf along in it.

Agriculture. As to their Agriculture, all their Fields (where any thing is planted) whether high or low, are made into ſuch Plots as may retain the Water on them when they pleaſe. They plow up the Ground with one Buffalo or one Cow. Where they are to ſow Rice, they prepare the Fields very well, by clearing it of all manner of Weeds, moiſtening to a Pulp, and ſmoothing it with a Frame drawn acroſs; on which they ſow the Rice very thick, and cover it only with Water for two or three Inches high; and when it has grown ſix or eight Inches long, they pull it up by the Roots, and tranſplant it (by Tufts in a ſtrait Line) to Fields overflown with Water; and where a Field is ſubject to Weeds, when the Water dries up, they prevent their Growth, in overturning the Mud with their Hands in their Interſtices where the Rice is planted. When they ſow Wheat, Barley, Pulſe, and other Grains, they grub up ſome ſuperficial Earth, Graſs, and Roots, and with ſome Straw they burn all together: This Earth being ſifted fine, they mix with the Seed, which they ſow in Holes made in a ſtrait Line, and ſo grows up in Tufts as the Rice does, the Field being divided into Beds, and harrowed over both before and after the Seed is ſown: This makes them ſomewhat reſemble Gardens. Although they meliorate their Fields where they ſow Rice, only by letting the Water on them; yet for other Grains, where Ground requires it, they make much Uſe of Dung, human Excrements, Aſhes, *&c.* In watering their Fields here, they uſe the ſame Inſtrument mentioned by *Martini* in the Preface to his *Atlas*, being all of Wood, and the Contrivance the ſame with that of a Chain-Pump.

The making of Salt. Their Method in *making* of *Salt* is this: All the Shores here being Mud, inſtead of Sand, in the Summer-Seaſon they pare off the ſuperficial Earth, which has been overflown with the Salt-Water, and lay it up in Heaps for Uſe: When they are to uſe it, they dry it in the Sun, rubbing it ſmall; then digging a Pit, they cover the Bottom thereof with Straw, at which, through the ſide of the Pit, they paſs a hollow Cane, that leads into a Jar, which ſtands below the Level of the Pit's Bottom; they fill the Pit almoſt full with the aforeſaid Earth, and pour Salt-Water thereon till it be cover'd two or three Inches with Water, which drains through into the aforeſaid Jar, and is afterwards boil'd into Salt.

I find the printed News-Papers laſt Year take Notice of a ſingular Root brought from *China* by *F. Fontaney:* I have ſeen one here called *Hu-chu-u*, (which I take to be the ſame) whereto they aſcribe wonderful Properties of prolonging Life, and turning grey Hairs into black, by drinking its Infuſion for ſome time, inſomuch that they ſay it is to be had in Value from 10 *Tael* to 1000 or 2000 a ſingle Root; for the larger it is, the more is its Value and Efficacy. It is mentioned in *Cleyer's Medicina Sinica*, Nº. 84, under the Name of *Ho-xeu-u*, according to the *Portugal* Spelling; it is likewiſe painted in the 27th Table of thoſe Plants Mr. *Petiver* had of me.

The Story of its Diſcovery is this: That once upon a time a certain Perſon going a ſimpling upon the Mountains fell by Accident into ſuch a ſteep Valley, that he could by no means get out of it again; whereupon looking about for ſomething to ſuſtain his Life, he ſpy'd this Root, of which he made tryal, and found, that in eating thereof it ſerved him both for Proviſions and Cloathing, by keeping his Body in ſuch a Temperature, that the Injuries of the Weather had no Influence upon him during his Stay there, which was ſome hundreds of Years; till at laſt an Earthquake happen'd in that Place, whereby the Mountains were rent, and he found a Paſſage to his Houſe, from whence he had been ſo long abſent. But the many Alterations that came to paſs there in ſuch a ſpace of Time, would not permit them to give Credit to his Story; till conſulting the Annals of their Family, which gave an Account of one of them loſt at that time, they were confirm'd in the Truth of his Relation.

Of the Way of taking and taming of Elephants *in the Iſland of* Ceilan, *by Mr.* Strachan, n. 277. p. 1051.

XVII. All the Natives within twenty Miles from the Sea-Coaſt betwixt *Matura* and *Negumbo* are ſubject to the *Hollanders*, and know the Duty and Service which their *Eaſt-India-Company* requires of them; therefore when Orders are given to hunt the Elephants, they pitch upon a convenient Place for a Warren or Park, which is broad at the Entrance, and turns farther into the more narrow, ſo that at the End it is ſo narrow that the Elephant cannot turn himſelf; yet this narrow Place is ſo long, that twenty Elephants may ſtand one behind another. The Park being perfected, the *Koolrale*, who is the Head or Chief of the *Kool* (in *Engliſh* a Shire) does order the Inhabitants who dwell thereabout to their Places, who make a Circumference about the Woods where they know that Elephants are, which will be the length of ſixty *Engliſh* Miles. At firſt one Man ſtands from another at the diſtance of about five Poles, or twenty-five Yards, and kindles Fire in the Spaces between them; then by ſhouting, crying, beating of Drums, ſounding of Horns, the Elephants retire towards the

Park; and ſo from time to time the Men follow, ſhouting and making a noiſe, until the Circumference be ſo little, that they ſtand upon one another's Side. The Elephants, when they find themſelves incloſed within the Park, make more Reſiſtance, ſome turning back upon the Men; but Poſts are ready ſtanding betwixt the Men and the Elephants, and long Stakes lying upon the Ground; they have only to lift theſe Stakes, and make the Ends of theſe Stakes faſt to the Poſts, and thus the Elephants are incloſed within the Park. Then by following the Elephants, and caſting off Fire-brands, they chaſe them ſtill farther toward the End of the Park, and cloſing up the Paſſage behind them, by ſetting up, and laying Stakes athwart the Poſts, until at laſt they are all entered into the narrow Place, where they cannot turn themſelves. But becauſe there are many Sorts of Elephants, ſome being a great deal higher before than behind, and many who never have the two long Teeth; others are of a more ſavage Nature, which are known by their Eyes and Face, having a fierce Tyger-Look, and will be for no Service, although they be kept 10 Years: ſuch ones the King of *Candie* keeps for puniſhing of Tranſgreſſors, for they kill all Perſons that come within their reach. One of them the late King of *Candie* ſent to the *Hollanders*, in recompence of ſome Preſents which the *Hollanders* had ſent to him. The *Hollanders* kept the ſame Elephant in a Place by himſelf ſtill tied, being at great pains every Day to bring him to the Water-ſide betwixt two tame Elephants. Such like Elephants being among the other Elephants in the Park, are kept out of the narrow Entrance, by caſting Firebrands upon them when they draw near the narrow Entrance, and endeavour to kill them by Guns, and cutting off their Snout, by which they take all their Victuals; which being cut, they periſh for Hunger when they are eſcap'd; for the Natives being very ſwift, will come very near them with their Swords. When all the Choice of the Elephants are enter'd into the narrow Paſſage, there are Poſts put athwart, ſo that none can come back. The reſt that are not fit for Service, have liberty to eſcape.

It is eaſy to conceive how the Natives did invent the chaſing Elephants by Drums and Noiſe, becauſe it is obſerved that they themſelves are affrighted by Drums. I heard an ancient *Portugueſe* relating, that when his Countrymen were in Poſſeſſion of this Iſland, they did purſue the Natives too far up among the Woods and Hills: The *Ceilàneſe* by this means got the Advantage of the *Portugueſe*, and killed every Man of them, except one Drummer, who obſerving them not to draw near where they heard the Drum, he therefore beat upon his Drum continually; the *Ceilaneſe* thinking that the greateſt Power was where the Drum did beat, did not come near him, and by this means he ſaved his Life.

When the Elephants have been a while ſettled in the narrow Paſſage, they are one by one taken to the Stable, being tied faſt between two tame Elephants bred for that Purpoſe, the Point of whoſe long Teeth are cut. If the wild Elephant be troubleſome, they will hold his Trunk with their Trunk, and beat him with their Teeth, a Man ſitting upon each of the tame Elephants, to direct them by a Staff, upon the End of which is a little Hook, wherewith he touches his Head, and orders the tame Elephant as he pleaſes, without a Bridle, or the like. When they come into the Stable, they are led betwixt two Poſts, and Stakes put athwart before their Breaſts and under their Bellies, and ſo tied that they cannot ſtir, nor lie down upon the Ground; for if they ſhould be permitted to lie down, they would turn heavy, ſorrowful, and would not eat, and die. They are this way fed and nouriſhed with the Trunk of *Waltugas*, or *Plantains*. The Trunk of this Tree they love better than any other Food, and with theſe Trunks they are fed in the Ships. When they have been nouriſh'd ſo ſix Weeks, they begin to be tractable, and are faſtened only with one Foot tied with Cords; and if the Merchants come from *Bengal*, they are ſold and convey'd to the Ships. If the Merchants don't take them, they feed them with Leaves of the *Cocoa*-tree, until twelve Weeks be paſt after their being taken, and then they are as tame as a Dog, and eat Graſs with the Oxen in the Fields.

When the Elephants are put on board the Ships, there is a thing prepar'd of 15 or 20 double Sail-cloth, which is laid about his Breaſt, Belly and Sides, and is tied together upon his Back, whereunto Ropes are faſtened; then he is led into the Water betwixt Elephants bred for the purpoſe, upon which a Man ſits to govern him, and another Elephant (upon which ſits a Man) goes behind the Elephant that is to be ſhipp'd: and when this Elephant is unwilling to enter the Water, the Elephant that is behind puts his Head to the foremoſt's hinder Parts, and preſſes him forward, which would make any one laugh to ſee. When he is got deep enough in the Water, he is tied to the Boat, the other Elephants return, and he ſwims after the Boat to the Ship, where he is haled over into the Ship.

But there is lately invented a more convenient Way, which is thus: There is prepared a big Veſſel, flat-bottom'd, cover'd with Planks like a Floor, ſo that this Floor is almoſt of the Height of the Key; then the Side of the Key and the Veſſel are adorned with green Branches, ſo that the Elephant ſees no Water till he is in the Ship.

When one Elephant ſwims to the Ship, or otherwiſe croſſes a deep River, nothing of him can be ſeen only his Snout, through which he breathes: And when he is waſhed upon a River-ſide, he ordinarily lies with his Head upon the Bottom of the Water flat alike with his Body; and altho' one Side of him be above Water, his Head will be under, holding only his Snout above Water, through which he breathes.

When the Elephants are tame, they are very docile and tractable, ſo that they will lie upon their Belly when Men are to get up and ride upon them.

If they fall at any time, altho' upon even Ground, they either die immediately, or languiſh after that until they die; their Body being of ſo great a Bulk, is the Cauſe of the Harm they get by a Fall.

If an Elephant frequents a Plantation of Fruit-Trees of the Natives, (for no Hedges can keep him out) they make a Point upon a heavy Piece of Wood, and hang it on a Branch of a Tree, under which the Elephant uſes to come; and at Night a Man ſits watching upon that Branch, and when the Elephant comes under the Branch, the Man cuts the Cord, and ſo the Point of the Wood falls a Foot deep in his Back, by which means the Elephant languiſhes and dies: but when the *Hollanders* get Intelligence hereof, they are puniſh'd ſeverely.

Of the Ways *of* catching Fowl *and* Deer *in* Ceilan, *&c. by Mr.* Strachan. *n.* 278. *p.* 1094.

XVIII. The Way they catch Water-Fowls is this: In Loughs and Waters which are not very deep, the Fowler puts an earthen Pot upon his Head, in which Pot are bored Holes, through which he may ſee; then he wades in the Water, nothing being ſeen but the Pot which covers his Head, and thus enters in the midſt of all the Fowls. They, thinking it to be a Block, or the like, driving, do not take notice of it, although it be upon their Side; then he takes hold of one by his Foot, and draws him under Water, and wrings his Neck about. The reſt of the Fowls not perceiving this, ſit ſtill; then he goes to the next Fowl, and does the ſame; and ſo going forth, he catches as many as he pleaſes.

Thoſe that have Guns make a Frame, which they cover with green Branches, which are ſo broad as to cover their whole Body. They ſtand behind it; then carrying the Frame before him, the Bird or Deer ſeeing nothing but the green Branches, is not affrighted; and thus the Hunter being advanced near enough, gives fire.

It is wonderful to conſider how ſome Beaſts are affrighted by Fire, as Lions, Tygers, wild Swine, and other Beaſts; and as the *Ceilaneſe* chaſe the Elephants, wild Swine and Tygers from their Plantations by Fire, and the Natives at the *Cape of Good Hope* chaſe the Lions from their Cattle; ſo alſo do the *Ceilaneſe* catch Harts, Deers, Elks and Hares, which they do in this manner. In the Night-time two Men go into the Wood; one of theſe takes an earthen Veſſel upon his Head, wherein is Fire burning, made of Sticks and a kind of Reſin; and in one Hand he carries a Staff, whereon are faſtened eight Bells, which the more harmonious they are, ſo much the better: the other Man goes behind with a Spear in his Hand. Whenever the Deer perceiveth the Light, and hears the Bells, he draws near to it, ſtanding and beholding it as amazed, for he ſees not the Men; in the mean time the Man with the Spear pierces his Body, and catches him. Now Elephants, Tygers, Serpents and wild Swine run when they ſee the Fire, ſo that the Hunters need not fear them.

Serpents.

There are two Sorts of *Serpents* that Capt. *Knox* does not mention, which are thought not to be venomous, and a *Ceilaneſe* will not kill.

The firſt is of a bluiſh Colour, and comes frequently into Houſes, and ſearches for Rats only, and eats them; he creeps into their Neſt, and makes a Deſtruction among them: He is of the Thickneſs of an Inch and a half Diameter, and about two Yards and a half long.

The other is green like a Leaf of a Tree, who winds himſelf, and climbs upon the Trees, and catches the Birds, lying ſtill at the time, as if he had no Motion, until he ſees a fit Opportunity to catch. He is about one half Inch Diameter, and a Yard long.

The Ant-Bear. The *Talgoi* will lie as if he were dead beſide theſe little Neſts which are built by theſe Ants called *Waia*, letting his Tongue ſtick out as far as he can: Theſe Ants will immediately fix themſelves in great Numbers round about, and upon his Tongue, to carry away the Slime which is upon the Tongue; then he draws in his Tongue, and ſwallows them; and then he ſhoots forth his Tongue again, and continues ſo to do until he has ſatisfied his Hunger.

The Elephant. If a Man be lying or ſleeping, an Elephant will not mind him. A Company of *Dutch* Soldiers marching from *Columbo* to *Gurbewil*, one of them did ſtay behind to reſt himſelf, and did ſlumber upon the wayſide. An Elephant coming out of the Woods, went within two Paces of him; but when he was paſſed by about ſeven or eight Paces, the Soldier awaked, and ſeeing the Elephant, and not thinking it ſafe to run, becauſe the Elephant did not mind him, lay ſtill until he perceived the Elephant to be gone.

Cinnamon-Trees. There are two Sorts of *Cinnamon*-Trees; of which, the Tree which is eſteemed the beſt has a Leaf much larger and thicker than the other; but otherwiſe no Difference is perceived. If theſe Leaves, as well one Sort as the other, be diſtilled, they yield an Oil and Water, as if Cloves had been in the Still.

Upon the Root of the Tree is a thick Bark, which, when it is diſtill'd, as the former, yields Oil and Camphire; which is ſeparated by covering the Receiver with a Linnen Cloth, and the Camphire will remain in the Cloth in a Lump together, and the Oil and Water will run into the Receiver. This Camphire has the ſame Colour, the ſame diſcuſſing, diſſolving, and healing balſamic Quality as the Camphire of *Japan*; the Oil is of the ſame Virtue; anointed upon Scabs, Itch, and Excoriations, it cures them in a ſhort time.

To drink the Water among common Water cures Fluxes, and does good to thoſe who are under that languiſhing Diſeaſe, called by the *Hollanders* the *Land's Diſeaſe*, and by the *Ceilaneſe*, *Pipa*.

I never did ſee the Natives make uſe of Cinnamon, although they ſcarcely have a Meal without Pepper: Neither is it uſed by the *Europeans* either in Meat, or diſtilled among the Rack, or infuſed in Drink, for it is thought that it occaſions Shortneſs of Breath; but this I have no Experience of. Whether this be the Cauſe of it, or whether the *Ceilaneſe* are fearful to bring it to particular Men, ſeeing the *Hollanders* have ſevere Laws againſt the ſelling of it, I cannot tell.

Obſervations on Coral, Rubies, *&c. and the* Gods *of the* Ceilaneſe, *by Mr.* Strachan. *n.* 282. *p.* 1248.

XIX. There is great quantity of a kind of white *Coral* upon the Shore betwixt *Gale* and *Mature*, and many other Coaſts in the *Indies*, of which the *Hollanders* cauſe Lime to be burnt for building of Houſes, and the Walls of the Fortifications. There are great Banks of the ſaid Coral; it is porous, neither ſo firm and ſmooth as the upright, which grows in little Branches; and when they are come to the full Growth, there grows other betwixt theſe, and then upon theſe grows other, until it is become like a Rock fot Thickneſs. Theſe Branches are not ſofter when they are young, than when they are ripe; yet I obſerved a Slime upon them always when they are under Water, which I ſuppoſe is the Subſtancee which petrifies.

Large Oyſters.

I have ſeen (three Leagues from *Batavia*, upon that Iſland, where the *Hollanders* turn up the Keel of the Ships to dreſs and mend them) *Oyſters* of a Foot Diameter. The Shell of one of theſe did grow till it was three Foot in Diameter broad, and a Foot thick, after the Fleſh was putrified; upon theſe Shells, lying only three or four Foot under Water, I alſo always did find a Slime. Upon the Coaſt betwixt *Gale* and *Gindere* lies always *Os Sepiæ*, and in the River at *Catoene* there are found Rubies; and if one is deſirous, and ſeeks among the Sand in the Water, he will find above a Drop weight of Rubies in the ſpace of one Hour: but they are very ſmall, for 20 of them will ſcarcely weigh a Grain weight.

Cockles.

Upon the Sea-Coaſt upon the Sand do lie a kind of little Cockles of the Bigneſs of Crabs Eyes, or *Oculi Cancrorum*. There is no Cavity within; if beat in Powder, they have the ſame Effect as *Teſtaceous* Powders, and are uſed inſtead of *Oculi Cancrorum*.

A ſort of a Ficus Indica.

There are ſeveral Trees, one of which will be above ſix Fathom high, whoſe Root (I may ſay) grows above ground, after the following Manner: When the Twig is about half a Foot high above ground, there grows out of the middle of the Stem a little Knot, which grows downward, making an Angle with the Stem of 30 Degrees, or thereabout, until it touches the Ground; then it fixes in the Ground, ſending forth ſmall Sprigs, which before it touch'd the Ground had neither Branch nor Leaves, but all over green like a Shoot. While this Shoot grows, and the Stem grows higher, it ſtill ſhoots forth other Shoots, which always come out of the middle of the Tree or Trunk. Thus it continues ſhooting forth theſe Shoots, until the Tree be at his full Growth; and the higher the Trees grow, the Knots and the Shoots are the thicker and longer; ſo that one of the Shoots which grows laſt, will be a Foot thick of Diameter, and three Fathom long.

Now the Flower which is called *Happumal* grows upon a Tree that grows after this manner, and grows only two Fathom high. If they are planted round an Orchard, they are an excellent Hedge, for the Leaves are thorny and full of Pricks. When the Flower decays, it carries a Fruit like a Pine-apple, but is for no Uſe.

Some Naturaliſts affirm all Plants to have a Heart, or ſomething analogous to it; it would be worth the Enquiry in what Place the Heart of theſe kind of Trees is, as alſo the Palmito and Coco-tree.

Of the Gods *of the* Ceilaneſe.

It is very difficult to know which of theſe two have a greater Reſpect given to them, the *Budum* or *Sakradewendra*.

Sakradewendra commands and governs all the reſt of the Gods, and did hear formerly the Prayers that were offered up to him from diſtreſſed People here upon Earth, and did grant their Requeſt; but now the Golden Chair whereupon he uſed to ſit, is gone; and the Prayers which are offer'd up to him now have no effect, becauſe the Foot of that Chair was made of a kind of Wax, which would turn ſoft by the Prayers and Tears of the Supplicators, and would ſink downward, by which means the *Sakradewendra* would look down and take notice of the Prayers of the Supplicants, and grant their Requeſt.

This Chair being of fine Gold, was diſtributed among the Poor; which is the Cauſe why he does not now perceive or know when any Man makes Supplication to him; therefore there are but few People that have any Benefit of the Prayers and Tears which they offer to him.

He can indeed look far when he turns his Eyes towards any Place; for his Forehead reſembles the Peacock's Tail, it is ſo full of Eyes; and ſo ſometimes it chances that he looks down and takes notice of Men: but this is but ſeldom; therefore there is a Neceſſity for one to pacify theſe wicked Spirits which trouble us here on Earth. I could never underſtand of them how long this *Dewendra* had been a God, or how long he would reign; for none trouble their heads to regard him any more.

The *Budum*, whereof the *Banapots* (or their Bibles, if I may call them ſo) make great mention, has had the Life of all the Species of living Creatures that are in the World, having been firſt an Inſect; after his Death his Soul was regenerated into a Mouſe, after that an Ox, then a Monkey, &c. then a Man, and ſtill by his good Life and Merits was ſtill born in a better Condition, until he is become the ſupreme of all the Gods.

Of the *Buduns* there have been three; every one of theſe Reigns has been counted after this manner; there is a great Hill about half a Mile of perpendicular Height, and about ſix Miles in Circumference; from the Hill a certain Bird comes once in a thouſand Years, and takes one Grain to a certain Place, and continues every thouſand Years once, until he has removed that Hill to another Place.

Of the Mechanic *Arts, and* Phyſic *of the* Indians, *By Father* Papin, *extracted from the* Letters *of the* Miſſionary Jeſuits. *n.* 337. *p.* 225.

XX. This Country of *Bengal* furniſhes Materials for Mechanic Arts and Sciences more than any Country that I know of. The Artiſans here have wonderful Skill and Dexterity: They excel particularly in making Linnen Cloath; which is of ſuch Fineneſs, that very long and broad Pieces of it may eaſily be drawn through a ſmall Ring.

If, you tear a Piece of Muſlin into two Pieces, and give it to one of their Fine-Drawers to ſet it together again, it will be impoſſible for you to diſcover where it is joined; tho' you mark it on purpoſe to know it. They will place together ſo artificially the Pieces of Glaſs or *China* Ware, that one cannot perceive it was ever broken.

Their Embroiderers work in Filigreen very curiouſly: They imitate exactly any Work made in *Europe*, tho' the Engine they make uſe of, and all their other Utenſils, do not coſt them above the Value of a Crown.

The Looms that their Weavers uſe, do not coſt them more: With theſe they ſit in their Courts and Yards, or on the ſide of the Highway, and work thoſe fine Stuffs that are ſo highly eſteem'd over all the World.

They have here no need of Wine to make *Aqua Vitæ*; but make it of a Syrup, Sugar, ſome certain ſorts of Barks, and Raiſins: it burns better, and is ſtronger than that made in *Europe*.

They paint Flowers, and gild very finely upon Glaſs. I was ſurpriz'd to ſee their Veſſels, which they uſe to cool Water in, and are not thicker than two Leaves of Paper paſted together.

Their Watermen row after a different manner from ours; they move the Oar, with their Feet, and their Hands ſerve inſtead of the *Hypomochlion*, or Roller on which it turns.

The Liquor which their Painters uſe, does not any way loſe its Colour, nor is it tarniſh'd by Lye.

The Huſbandmen in *Europe* prick their Oxen with a Goad to make 'em go faſter; but here they only twiſt or wring their Tails. Theſe Beaſts are very docile: They teach them to lie down and riſe up when they take up or lay down their Burthen.

They make uſe of a kind of Hand-Mill to break their Sugar Canes, which does not coſt them above the Value of ten Pence.

The Perſon that grinds, works and faſhions the Stone himſelf with Lac and Emery.

Their Maſons will pave the largeſt Room with a ſort of Cement made of Brick-duſt and Lime, ſo that it ſhall ſeem to be but one Stone, and is much harder than Gravel.

I ſaw them make a ſort of Pent-houſe, that was forty Foot long, eight Foot broad, and five or ſix Inches thick; which they raiſed up in my preſence, and fixed it to the Wall on one ſide only, without putting any Prop under it to ſupport it.

Their Pilots take the Altitude (or Latitude of Places) with a Cord that has ſeveral Knots in it. They put one end of the Cord between their Teeth, and by means of a Piece of Wood fixed to it, that has a Hole through it, they eaſily obſerve the Tail of *Urſa minor*, which is commonly called the *Polar* Star, or North-Pole.

Their Lime is uſually made of Sea-Shells: That which is made of Snail-Shells ſerves to whiten their Houſes; and that which is made of

Stones they chaw with the Leaves of *Betel*. I have ſeen ſome of them that would take as much of it in a Day as the Quantity of an Egg.

They make their Butter in the firſt Pot that comes to hand; they cleave a Stick into four Quarters at one end, and ſtretching them out aſunder in Proportion to the ſize of the Pot that contains the Milk, they turn the Stick round different ways (backwards and forwards) by means of a Cord twiſted about it; and by this means in a ſhort time make the Butter.

Thoſe that ſell Butter have the Art of making it paſs for freſh, when it is old and rank. To do this they melt it, and pour upon it four curdly Milk; and in eight Hours after they take it out in Lumps, and ſtrain it through a Cloth for Sale.

Their Chymiſts make uſe of the firſt Pot they meet with to revive Cinnabar, and other Preparations of Mercury, which they do after a very ſimple Manner. They eaſily reduce all Metals into a Powder; as I my ſelf can witneſs. They ſet a great Value upon *Talk* and *Braſs*, which conſume, as they ſay, all viſcous Humours, and remove the moſt ſtubborn Obſtructions.

Their Phyſicians are more cautious in uſing *Sulphur* than they are in *Europe*: They correct it with *Butter*, and put Broth upon it made with long *Pepper*, in which are boiled the Kernels of the *Indian* Pine-apple. *Wolfs-bane* corrected in *Cows Urine*, and *Arſenic* corrected with Juice of *Lemons*, they uſe with ſucceſs in *Fevers*.

A Phyſician is not permitted to take care of a ſick Perſon, unleſs he can gueſs at his Diſeaſe, and what Humour is moſt predominant; which they eaſily know by feeling the Pulſe of the Patient. Nor are they often deceived.

The principal Diſeaſes that reign in this Country are, 1. The *Mordechin*, or *Cholera morbus*. The means by which they cure it, is, by not ſuffering the Patient to drink, and by burning the Soals of his Feet. 2. The *Sonipat*, or Lethargy; which is cured by putting into the Perſon's Eyes bruiſed Pepper mixed with Vinegar. 3. The *Pilbai*, or Obſtruction of the Spleen; for which they have no Specific Remedy, unleſs it be that of the *Jogbis*, (or converted *Indians*:) They make a ſmall *Inciſion* under the *Spleen*, and put in between the Skin and Fleſh a long Needle; from whence, by ſucking with the end of a Horn, they draw out of the Orifice a kind of fat Matter that reſembles *Pus* or Corruption.

Moſt of the Phyſicians have a Cuſtom of putting a Drop of *Oil* on the *Urine* of the ſick Perſon: If it ſpreads abroad, they ſay it is a ſign that the Patient is very hot within; but on the contrary, if it keeps together entire, it is a ſign that he wants Heat.

The common People uſe very ſimple Medicines. For the *Megrim*, they ſmoak, like Tobacco, the dried Bark of a *Pomegranate*-Tree reduced to a Powder, and mixt with four Corns of *Pepper*. For the common *Head-ach*, they ſmell to a *Nodule*, compos'd of a Mixture of

Sal-Armoniac, *Lime*, and Water, tied up together in a Linnen Rag. Such Dizzineſſes of the *Head*, as proceed from a cold thick Blood, they cure by drinking *Wine*, in which are ſteep'd a few Grains of *Frankincenſe*. For *Deafneſs*, occaſion'd by too great a Quantity of cold Humours, they drop into the Ear a Drop of Juice of *Lemons*. When the *Brain* is charged and oppreſſed with watery Humours, they ſmell to black *Cummin-ſeed*, bruiſed and tied up in a Nodule. For the *Tooth-ach*, they put upon the Tooth affected a Paſte made of Crumbs of Bread, and the Seed of the *Stramonium*, which ſtupifies the Part affected, and eaſes the Pain. In an *Hæmorrhage*, or Flux of Blood, they make the Perſon ſmell to bruiſed *Mother-wort*, or *Wormwood*. For a too great a Heat of the Breaſt, and *Spitting* of *Blood*, they cover over with Paſte a *Giraumont*, (which is an *Indian* Fruit like a *Gourd*, and taſtes like a *Citrul)* which they bake in an Oven, and drink the Water that comes from it. For the *Cholic*, that proceeds either from Wind or watry Humours, they give to drink four Spoonfuls of Water in which Aniſeeds and a little *Pepper* have been boiled to a Conſumption of half. They alſo bruiſe an *Onion* with *Ginger*, and apply it to that Part of the Belly where there is moſt Pain. For the *Lientery*, they roaſt a Clove of *Garlick* under the Aſhes, and when they go to Bed, they hold it in the Mouth, and ſuck out the Juice of it. If they drink the Juice of the Leaves of *Cucumber* bruiſed, it purges and vomits them. They cure a *Difficulty* of *Urine*, by drinking a ſpoonful of *Oil* of *Olive* well mixed together, with a like Quantity of Water. For a *Looſeneſs*, they torrify a Spoonful of white *Cummin-ſeed*, and a little powder'd *Ginger*, which they ſwallow mixt with Sugar. I have ſeen them cure *Fevers* which begin with a ſhivering Fit, by giving the Patient three large Pills made of *Ginger*, black *Cummin*, and long *Pepper*. For Tertian *Agues*, they give the Perſon for three Days together three Spoonfuls of the Juice of *Teucrium*, or great *Germander*, with a little *Salt* and *Ginger*.

XXI. 1.] Having received Orders to accompany the Reverend Father *Antonio Fuccio* of *Sicily*, our new Provincial of this Country, in viſiting with him our religious Houſes, I travelled over the Country of the *Pintados*; which are large Iſlands ſeparated from one another by Arms of the Sea, whoſe ebbing and flowing renders their Navigation very difficult and dangerous.

Of the Diſcovery *of the New* Philippine Iſlands, *by Father* P. Clain. *Extracted from the* Letters *of the* Miſſionary Jeſuits. *n.* 317. *p.* 189.

At the Town of *Guivam*, in the Iſle of *Samal*, the laſt and moſt Southern Iſland of the Eaſtern *Pintados*, we found twenty-nine *Palaos*, or Inhabitants of certain new diſcover'd Iſlands. The Eaſterly Winds, that blow on theſe Seas from *December* to *May*, have driven them three hundred Leagues from their own Iſlands, to this Town of the Iſle of *Samal*, where they arrived in two ſmall Veſſels, called *Paraos*: Of which we receiv'd this following Account.

They embarked, to the Number of thirty-five Perſons, to paſs over to one of the neighbouring Iſlands, when there aroſe a very ſtrong Wind, that forced them out into the main Sea, ſo that they could not gain the Iſland they deſign'd for, nor any of the neighbouring ones. They were driven before the Wind for ſeventy Days together, without being able to make any Land: At laſt they found themſelves in Sight of the Town of *Guivam* in the Iſle of *Samal.* A *Guivamois*, that was then on Shoar, perceiving them, and judging by the Make and Smallneſs of their Veſſels, that they were Strangers, and out of their Way, took a Piece of Cloth, and made them a Signal of entering the Road he directed, to avoid the Shoals and Banks of Sand they would otherwiſe run upon. Theſe People were ſo frighted at the Sight of this Stranger, that they began to put out again to Sea; but notwithſtanding all their Endeavours, the Wind forced them back a ſecond time towards the Shoar. When they were near, the *Guivamois* again made the Signal as before; but ſeeing they did not mind it, but would unavoidably be loſt, he threw himſelf into the Sea, and ſwam to one of their little Veſſels on purpoſe to bring them ſafe into ſhoar. He was no ſooner got to them, but the Women with their Children at their Backs, and all that were in the Veſſel, threw themſelves over-board and ſwam to the other: He, ſeeing himſelf alone in the Veſſel, reſolved to follow them, and getting aboard the ſecond, ſhew'd them how to avoid the Shoals, and brought them ſafe to Land. In the mean time they ſtood immoveable, and reſign'd themſelves up entirely to the Conduct of this Stranger, as ſo many Priſoners. They landed on the 28th of *December* 1696. The Inhabitants of *Guivam*, running to Shoar, received them very kindly, and brought them Wine and other Refreſhments. They eat Coco's very freely, which are the Fruit of the Palm-Trees of this Country: The Pulp of them is ſomewhat like that of Cheſnuts, except that it is more oily, and furniſhes them with a ſort of ſweet Water, very pleaſant to drink. They gave them Rice boil'd in Water, which is eat here and all over *Aſia*, as Bread is in *Europe.* They looked on it with Surprize; and taking ſome Grains of it, threw it on the Ground, imagining it to be Worms. They rejoice if one brings them great Roots, call *Palavan*, which they eat greedily.

In the mean time they brought to them two Women, that had formerly been driven on ſhoar on the Coaſt of *Guivam*; who knowing a little the Language of this Country, it was by their means they learnt what I ſhall relate. One of theſe Women found among thoſe Strangers one of her Relations, who, as ſoon as they knew one another, fell a weeping. The *Father*, who has on him the Care of this Town, having heard of the Arrival of theſe People, ſent for them to *Guivam.* As ſoon as they ſaw him, and what Reſpect was paid him, imagining that he was the King of the Country, and that their Lives were in his Hands, they threw themſelves on the Ground, to aſk his Pardon, and beg their Lives. The Father, moved with Pity to ſee them ſo diſconſolate, did all he could to comfort them.

The Inhabitants of *Guivam* ſtrove one with another, who ſhould entertain theſe Strangers at their Houſes, and furniſh them with Proviſions and Clothes, and whatſoever elſe ſhould be neceſſary; which the Father granted them, on condition they did not ſeparate thoſe that were married, or take leſs than two of them together, for fear any ſhould die of Grief if left alone. Of thirty-five Perſons that imbarked, there remained but thirty; five dying thro' want of Proviſions and other Hardſhips in ſo long a Voyage; and ſome time after their Arrival here died another.

They relate that their Country conſiſts of thirty-two Iſlands; which cannot be far diſtant from the *Mariana's*, as may be judged by the Make and Smallneſs of their Veſſels, and Form of their Sails, which are very like thoſe of the *Marianois*. It is likely theſe Iſlands may be eleven or twelve Degrees of Northern Latitude, more Southern than the *Mariana's*, and under the ſame Degree of Longitude as *Guivam*; for ſailing directly from Eaſt to Weſt, they came aſhore at this Town. It is alſo probable, that it was one of theſe Iſlands that was diſcover'd ſome Years ago at a diſtance, when a Ship belonging to the *Philippines*, leaving the common Road, which is from Eaſt to Weſt under the third Degree of Longitude, and running further to the South-Eaſt, firſt perceived it. Some called this Iſland *Carolina*, from *Charles* II. King of *Spain*; and others the Iſland of St. *Barnaby*, becauſe diſcover'd on the Day of that Apoſtle. It was again ſeen laſt Year by another Veſſel that a Storm had driven out of its Road, in going from hence to the *Mariana's*.

Theſe Strangers add, that of theſe thirty-two Iſlands there are three of them that are uninhabited, unleſs it be with wild Fowls; but the others are very well peopled. If one aſks them the Number of Inhabitants, they point to a Heap of Sand, to ſhew that their Number is infinite. The Names of theſe Iſlands are *Pais*, *Lamululutup*, *Saraon*, *Yaropie*, *Valayyay*, *Satavan*, *Cutac*, *Yfalcu*, *Piraulop*, *Ytai*, *Pic*, *Piga*, *Lamurrec*, *Puc*, *Falait*, *Caravaruvong*, *Ylatu*, *Lamuliur*, *Tavas*, *Saypen*, *Tacaulap*, *Rapiyang*, *Tavon*, *Mutacuſan*, *Piyla*, *Olatan*, *Palu*, *Cucumyat*, *Piyalacunung*. The three that have nothing on them but wild Fowls, are *Piculat*, *Hulatan*, *Tagian*. *Lamurrec* is the moſt conſiderable of all theſe Iſlands: It is there that the King of the Country keeps his Court; the Governors of all the other Iſlands are ſubject to him. Among theſe Strangers there is one of theſe Governors, and his Wife, who is the King's Daughter. Tho' they go half naked, yet their Carriage, and a peculiar Air of Greatneſs, ſufficiently diſtinguiſhes them from the reſt. The Huſband has his Body painted all over with certain Lines, in ſuch manner that they form ſeveral Figures: The reſt of the Men are alſo painted in like manner, more or leſs. The Women and Children are not painted at all. There are nineteen Men of them, and ten Women, of different Ages. The Make and Colour of their Face is much like that of the *Philippinois.* The Men have no other Clothes than a ſort of Saſh, ſeveral times wrapt about their Body, that covers their Reins and Thighs. They wear upon their Shoulders above an Ell and a half of coarſe Linnen Cloth, like a Cowl, tied before, and hanging looſe behind. Both Men and Women are dreſſed much alike, except that the Women have a piece of Cloth ſomewhat longer, that hangs from their Waiſt down to their Knees.

Their Language is different from that of the *Philippines* and *Mariana's:* Their manner of pronouncing it comes neareſt that of the *Arabs,* as ſome who underſtand that Language have obſerv'd. The Woman, that ſeems the moſt conſiderable amongſt them, has ſeveral Rings and Necklaces of Tortoiſe-ſhell, (call'd here *Carey)* and others made of a Subſtance yet unknown to us, much reſembling Ambergriſe, but not tranſparent.

The manner of their Living at Sea, which was for ſeventy Days together, continually driven by the Wind, was thus: They caſt out a ſort of Net, made of a great Number of little Twigs of Trees tied together, having a large Mouth for the Fiſh to enter in at, and ending in a Point to prevent their getting out again. The Fiſh they took after this manner, was all the Nouriſhment they had, and Rain-water ſaved in Coco-ſhells, which is the Fruit of the Palm-Tree, of the Figure and Size of a human Skull.

They have no Cows in their Iſlands: As ſoon as they ſaw them, they ran away, as they did likewiſe at the barking of a Dog in one of the Miſſionaries Houſes. Neither have they Cats, Stags, Horſes, or in general any Quadruped. Nor any Fowls but Sea-Fowls; excepting Hens, which they breed up, but never eat their Eggs.

Notwithſtanding this their want of every thing they are very merry and contented with their Condition. Their Songs and Dances are exact and regular: When they ſing, it is all together; every one obſerving the ſame Humour and Geſtures; which makes it very agreeable.

They are ſurprized at the Government, Politeneſs, and Manners of the *Europeans,* of whom they had not the leaſt Knowledge. They admire not only the Solemnities and Ceremonies of the Church in celebrating Divine Service; but alſo the Muſick, Inſtruments, Dances of the *Spaniards,* and their Arms: But Gunpowder is what raiſes in them the greateſt Admiration. They wonder at the Whiteneſs of the *Europeans,* in reſpect of whom they are perfectly tawny, as well as the Inhabitants of this Country.

It does not yet appear, that they have either any Knowledge of a Deity, or that they worſhip Idols. Their Life is perfectly ſavage, taking care of nothing but eating and drinking, in which they obſerve no ſet time, but eat and drink at any Time or Place, when hungry or thirſty, or they can find any thing to ſatisfy themſelves; yet they eat but little at a time, and never enough to ſuffice for a whole Day. They ſhew a great Reſpect and Deference for their King, and Governors of their Towns, and obey them very preciſely.

Their Civility and Reſpect conſiſts in taking hold of the Hand or Foot of the Perſon they honour, and rubbing gently his Face. They have among their Utenſils ſome Saws, not made of Iron, but of a large Shell, called here *Taclobo*, rubbed and ſharpen'd upon a certain kind of Stone. They were ſurprized at a Merchant Ship that was building at *Guivam*, to ſee the Number of Carpenters Tools that were uſed about it: They viewed them all, one after another, with a great deal of Admiration. They have no Metals in their Country. The Father Miſſionary made each of them a Preſent of a large Piece of Iron, which they received with as much Joy, as if it had been ſo much Gold; and are ſo afraid it ſhould be ſtole from them, that they lay it under their Heads when they go to ſleep. They have no other Arms but Lances or Darts, made of human Bones, very well ſharpen'd and fixed on. They are very peaceful of themſelves; but if any Quarrel happens among them, it is decided with ſome Blows on the Head with the Fiſt, which yet very rarely happens; for when they would come to a cloſe Fight, they ſeparate them, and they are ſoon reconcil'd again. They are not dull and heavy, but, on the contrary, have a great deal of Livelineſs and Courage. They are not ſo luſty as the Inhabitants of the *Mariana's*, but nevertheleſs are well proportioned, and of a Shape much like thoſe of the *Philippines*. Both Men and Women let their Hair grow long, and hang looſe on their Shoulders.

When they underſtood they were be conducted to the Preſence of the Father Miſſionary, they painted their Bodies all over with a yellow Colour, which is look'd upon by them as a great Beauty. They are ſo well ſatisfied with finding here Plenty of every thing that is neceſſary for Life, that they offer'd to return home, and bring with them their Countrymen to enter into a Commerce with theſe Iſlands: Which Deſign our Governor liked very well, in hopes thereby to gain this Country to the King of *Spain*. The oldeſt of theſe Strangers was once before caſt on the Coaſt of *Caragan*, in one of our Iſlands; but finding there none but Infidels, that lived in the Mountains and Deſarts, he returned home again, without knowing any thing of the Plenty and Riches of theſe Iſlands. They are very expert at diving; and they ſay, they lately, in fiſhing, took two large Pearls in their Shells, but threw them into the Sea again, not knowing the Value of them.

—*on the ſame, by Father* Le Gobien. *Ibid.* Fig. 73.

2.] I here ſend a Map of the New *Philippines*; which is one of the moſt extraordinary Diſcoveries that has been made in theſe laſt Ages. It is ſtrange that theſe Iſlands, being ſituate between the *Molucco's*, the

Old *Philippines*, and the *Mariana's*, which have been known near theſe two hundred Years, ſhould remain undiſcover'd till now. They are eighty-ſeven in Number, and make one of the fineſt *Archipelago's* in the Eaſt; being incloſed on the North and South between the Line and the Tropick of *Cancer*, and on the Eaſt and Weſt between the *Mariana's* and *Philippines*.

Fig. 73. This Map was not made by *Europeans*, for none have yet been upon theſe Iſlands, but by the Iſlanders themſelves, after this manner: Some of the moſt ſkilful of 'em ranged upon a Table as many little Stones as there are Iſlands belonging to their Country, and marked out, as well as they could, the Name of each, its Extent and Diſtance from the others: And this is the Map, thus traced out by the *Indians*, that is here engraved.

The Natives of theſe Iſlands never offer any Violence to one another: Murder and Homicide are unknown to them; and they have a Proverb among them, That *one Man never kills another*. It is probable theſe Iſlands may abound in Gold, Amber and Drugs; being ſituate nearly under the ſame Degree of Longitude as the *Molucco's*, from whence we have Nutmegs, and other valuable Spices.

Tho' theſe People ſeem barbarous to us, yet they have among themſelves a ſort of Politeneſs and regular Government. Every Iſland obeys its Chief, who himſelf is ſubject to the King of the Country. This Prince holds his Court in the Iſland of *Falu*, called likewiſe *Lamuirec*; which Multiplicity of Names ſeems to be the Reaſon that we cannot find in this Map ſcarce any of the Names mention'd in Father *Clain*'s Letter; or perhaps becauſe at firſt, from the Natives Pronunciation of the Names of their Iſlands, they were written by the *Spaniards* after a different manner from what they are at preſent.

Tho' theſe Iſlands were never heard of in *Europe* 'till within theſe five or ſix Years, yet 'tis a long time ſince from the high Mountains of *Samal* they have diſcover'd thick Smoaks on that Coaſt; which commonly happens in Summer-time, when theſe Iſlanders ſet fire to their Woods and Foreſts to clear up the Ground. Theſe Smoaks, which the Fiſhermen of *Mindanao* and other Iſlands have alſo obſerved when far out at Sea, have made them conjecture, that there was Land Eaſt of the *Philippines*; but they never had any certain Knowledge of it, till ſome time before the above-mention'd Arrival of theſe Iſlanders at *Samal*. Which happened thus:

The King's Brother of theſe New *Philippines*, in a Sea Voyage, was driven on the Coaſt of *Caragan*, in the great Iſland of *Mindanao*. The *Spaniſh* Fathers received this Prince with a great deal of Honour and Friendſhip, and inſtructed him in the *Chriſtian* Religion; which he was ſo well pleas'd with, that he never thought of returning again to his own Country. In the mean time the King, diſſatisfy'd at the Loſs of his Brother, fitted out a Fleet of an hundred ſmall Veſſels, which he ſent to every Iſland under his Dominion, to ſee if they could learn

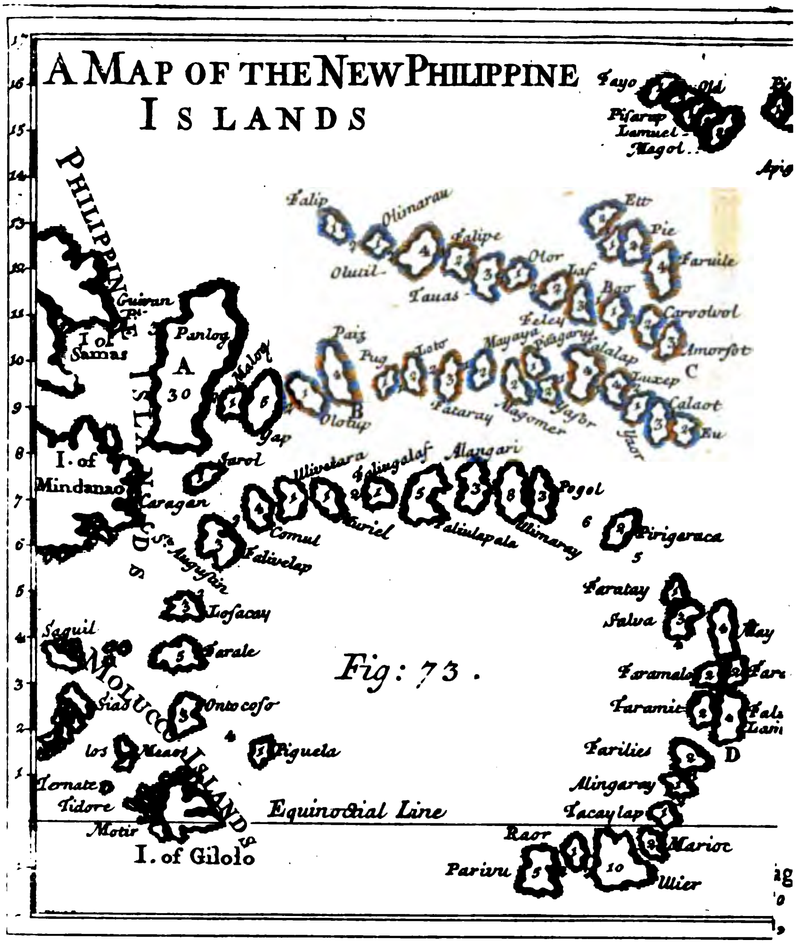


Fig: 73.

Fig. 68.

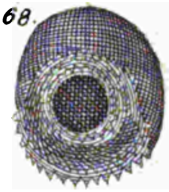


Fig. 69.

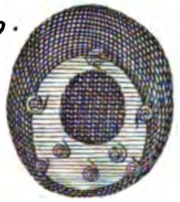


Fig. 70.

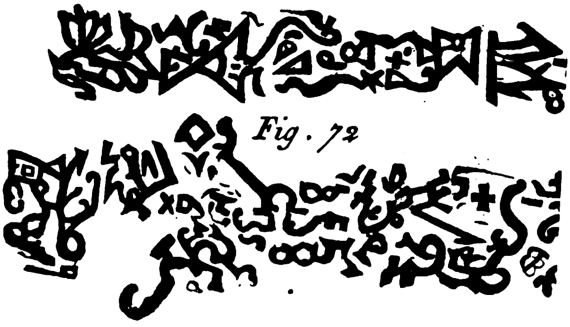
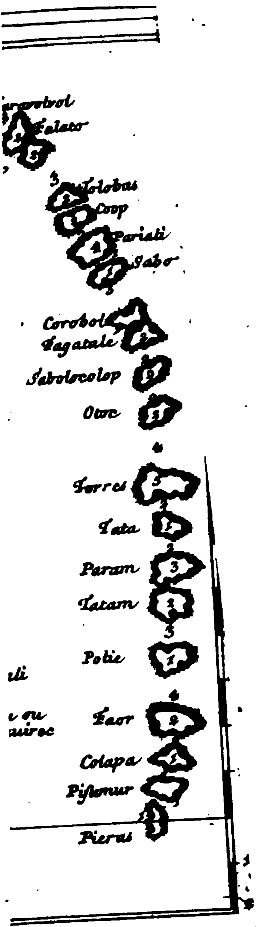


Fig. 72

Fig.


rarotrol
Falato
Solobas
Coop
Pariali
Sabo
Corobolo
Sagatale
Sabolscolop
Otoc
Torres
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Param
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li
e ou
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Colapa
Pisonur
Pieras

Fig.

any News of him. One of theſe little Veſſels was forced by a Storm on the Coaſt of *Caragan*, at the ſame place as the King's Brother was before: Where landing, they immediately knew him, and with Tears told him the Occaſion of their Journey, the Diſcontent of the King his Brother, and deſired him to return back with them. The Prince thanked them for the Trouble they had been at, and deſired them to ſatisfy the King, that he was well and contented; but could not, by any means, be perſuaded to return home again.

Fig. 73.

The Figure *in the* midſt *of every* Iſland *ſhows how many Days ſail it is in Circumference.*

The Figure *between each Iſland ſhews how many Days are required to paſs from one to the other.*

As for Inſtance. *The Figure* 30, *in the Iſle of* Panlog, *ſhews that it is* 30 *Days in Circumference; and the Figure* 3, *between the Cape of* Guivam *and the Iſle of* Panlog, *ſhews that it is three Days Paſſage to it.*

The Indians, *who were the Occaſion of thoſe Iſlands being diſcovered, imbarked in the Iſland* Amorſot, *marked in the Map by the Letter* C, *with a deſign to paſs to the Iſle of* Paiz, *marked by the Letter* B; *but were driven by a Storm out to Sea, and after 70 Days Sail caſt on the Cape of* Guivam *in the Iſland of* Samal, *called by the* Spaniards Ibabao.

A. *the largeſt of theſe Iſlands, named* Panlog.

D. *the Iſle of* Falu, *or* Lamuirec, *where the King holds his Court.*

Of a Paſſage *by* Land *to* California, *and a* Deſcription *of that Country by* Fr. Maria Picolo, *taken from the* Letters *of the* Miſſionary Jeſuits. *n.* 318. *p.* 232.

XXII. I ſhall give an exact and faithful Account of the Diſcoveries and Settlements that Father *de Salvatierra* and my ſelf have made in *California* for theſe five Years paſt.

We imbark'd in *October* 1697, and paſs'd the Sea that ſeparates *California* from *New Mexico*. As ſoon as we ſet foot on Land, the People being ignorant of our Deſign (as not underſtanding our Language, nor we theirs) imagining that we came to take from them the Pearl Fiſhery, as had been attempted ſeveral times before by others, came in great multitudes againſt us, who had but an inconſiderable Number of *Spaniards* to defend us. The Violence with which they attack'd us, and the multitude of Darts and Stones they threw at us, our Soldiers ſuſtain'd ſo vigorouſly, that they beat them back with ſucceſs, and ſoon put them to flight.

Theſe *Indians*, after this Defeat, became more tractable: and ſeeing they could not gain any thing on us by Force, deputed ſome amongſt 'em to come and treat with us. We receiv'd them very friendly, and ſoon learned of them enough of their Language, to let 'em know the reaſon of our coming into their Country. Theſe Deputies undeceived the reſt; ſo that being ſatisfied of our good Intentions, they came to us in great numbers, and ſhew'd a great deal of Joy to ſee that we were willing to inſtruct them in our Religion. This happy

Diſpoſition encouraged us to ſtudy throughly the *Monqui* Language; in which, and inſtructing the People, we ſpent two Years.

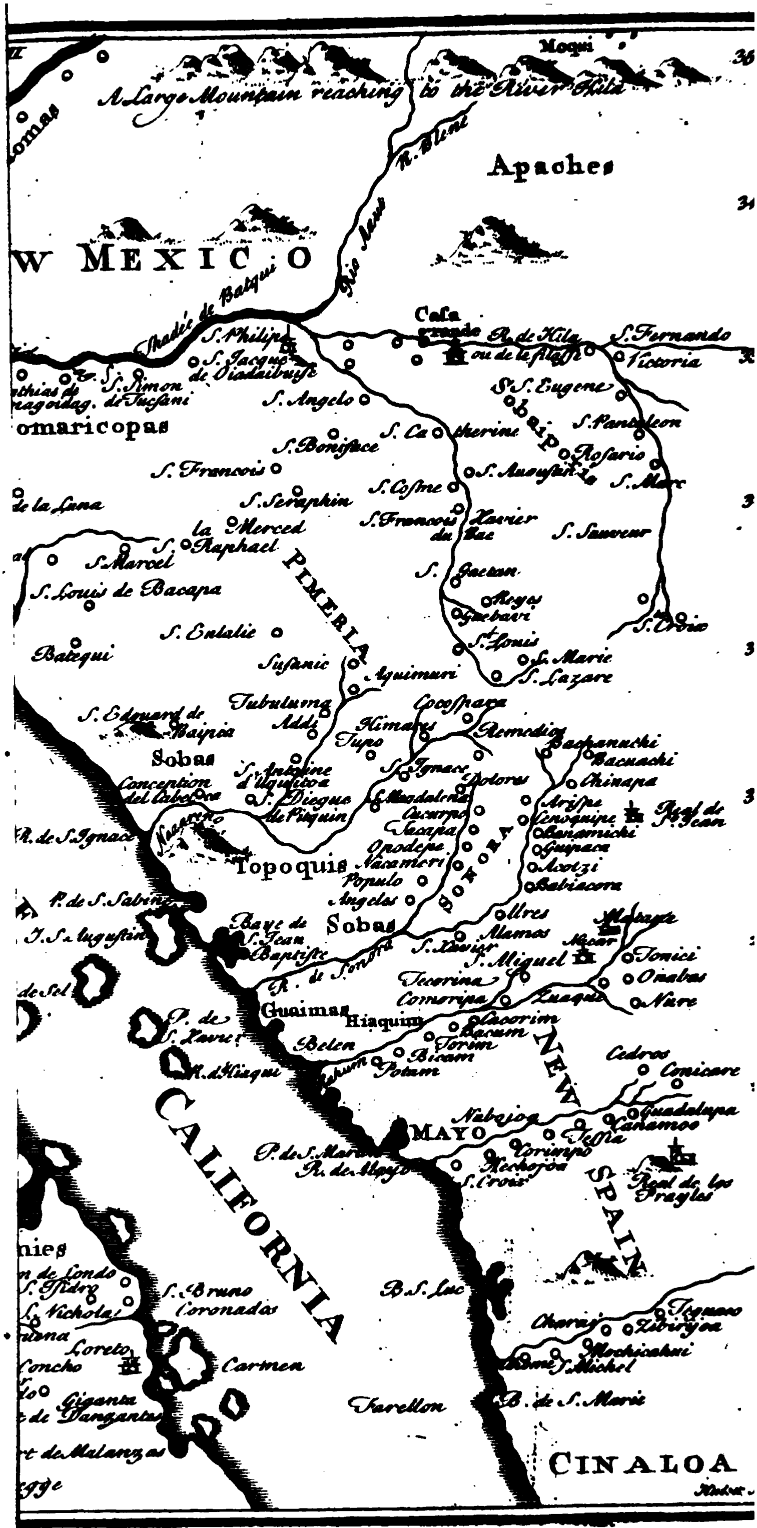
Fig: 74. After this we thought of diſcovering other Nations; which that we might do more ſucceſsfully, the Father *de Salvatierra*, and my ſelf, reſolved to ſeparate, and take two different ways: He went to the North, and I to the South and Weſt. By this means Father *de Salvatierra* by little and little diſcover'd all thoſe Habitations, that, at preſent, compoſe the Miſſions of *Loretto*, *Concho*, and St. *John* of *Londo*; and I, all that Country, at preſent call'd the Miſſion of St. *Francis Xavier* of *Biaundo*, which extends itſelf to the South-Sea.

In proceeding each of us his way, we obſerved ſeveral Nations of different Tongues mixt together: Some of them ſpoke the *Monqui*, which we underſtood; and others the *Laymon*, which yet we knew nothing of. This obliged us to learn the *Laymon*, which is of greater Extent than the *Monqui*, and ſeems to be univerſal in this large Country. We apply'd our ſelves ſo cloſe to the Study of this ſecond Language, that we learnt it in a little time, and began to preach indifferently in either.

Since our ſecond Diſcoveries we have divided all this Country into four Miſſions. The firſt is that of *Concho*, or Our Lady of *Loretto*. The ſecond that of *Biaundo*, or St. *Francis Xavier*. The third, that of *Yodivinegge*, or our *Lady of Grief*. And the fourth, which is not yet founded, or ſo well eſtabliſh'd as the other three, is that of St. *John* of *Londo*.

Every Miſſion contains ſeveral Towns: That of *Loretto-Concho* has nine belonging to it; *vix. Liggige*, two Leagues from *Concho*; *Jetti*, three Leagues; *Tuiddu*, four Leagues. Theſe three lie to the North, and the ſix following to the South: *Vonu*, two Leagues diſtant; *Numpolo*, four Fig. 74. Leagues; *Chuyenqui*, nine Leagues; *Liggui*, twelve Leagues; *Tripue*, fourteen Leagues; *Loppu*, fifteen Leagues. There are eleven Towns in the Miſſion of St. *Francis Xavier* of *Biaundo*, viz. *Quimiauma*, or the *Guardian Angel*, at two Leagues diſtance; *Lichu*, or *the Mountain of the Knight*, at three Leagues; *Yenuyomu*, at five Leagues; *Undua*, at ſix Leagues; *Enulaylo*, at ten Leagues; *Picolopri* at twelve Leagues; *Ontta* at fifteen Leagues; *Onemaito*, at twenty Leagues. Theſe eight lie to the South, the two following to the North; *Nuntei*, at three Leagues, and *Obbee* at eight Leagues: *Cuivuco*, or St. *Roſalia*, at four Leagues Diſtance towards the Eaſt. The Miſſion of our *Lady of Grief* comprehends only *Unubbe*, on the North; *Niumqui*, or St. *Joſeph*; and *Yodivinegge*, or our *Lady of Grief*, which gives name to the whole Miſſion. *Niumqui* and *Yodivinegge* are two Towns very well peopled, and near one another. Laſtly, the Miſſion of St. *John* of *Londo* contains five or ſix Towns. The principal are *Teupnon*, or St. *Bruno*, three Leagues diſtant to the Eaſt: *Anchu*, at the ſame Diſtance to the North: *Tamonqui*, at four Leagues; and *Diutro* at ſix, both towards the Eaſt: Beſides *Trippue* and *Loppu*, two Towns to the South, lately diſcovered.

Having



Moqui
A Large Mountain reaching to the River Hila
R. Blanc
Apaches
W MEXICO
Rio Azul
Shadée de Batqui
Casa grande
R. de Hila ou de la flesse
S. Fernando
Victoria
S. Philipe
S. Jacque de Viadaibusse
S. Simon de Tucsani
omaricopas
S. Angelo
S. Eugene
Sobaipuris
S. Pantaleon
S. Catherine
S. Boniface
Rosario
S. Augustin
S. Marc
S. Francois
S. Cosme
S. Seraphin
de la Luna
S. Francois Xavier du Bac
S. Sauveur
la Merced
S. Raphael
S. Marcel
S. Gaetan
S. Louis de Bacapa
Reyes
Guebavi
PIMERIA
S. Eulalie
S. Louis
S. Croix
Batequi
Susanic
Aquimuri
S. Marie
S. Lazare
Tubutuma
Cocospara
S. Edouard de Baipia
Addi
Himares
Tupo
Remedios
Bacanuchi
Sobas
S. Antoine d'Uquitoa
S. Ignace
Bacuachi
Dolores
Chinapa
Concention del Caborca
S. Diegue de Pitiquin
Magdalena
Arispe
Real de S. Jean
Cucurpe
Senoquipe
R. de S. Ignace
Nazareno
Tacapa
Banamichi
Opodepe
Guipaca
Topoquis
Nacameri
Aconzi
SONORA
Populo
Babiacora
P. de S. Sabine
Angeles
Ures
Baye de S. Jean Baptiste
Sobas
Alamos
Matape
I. S. Augustin
Mocar
S. Xavier
S. Miguel
Tonici
R. de Sonora
de Sel
Tecorina
Onabas
Comoripa
Zuaque
Nure
P. de S. Xavier
Guaimas
Hiaquim
Tacorim
Bacum
Belen
Torim
Bicam
Cedros
R. d'Hiaqui
Potam
Comicare
NEW SPAIN
CALIFORNIA
Nabajoa
Guadalupa
Canamoa
MAYO
Jessia
P. de S. Martin
Corimpo
R. de Mayo
Mechojoa
S. Croix
Real de los Frayles
nies
S. Isidro
S. Bruno
S. Nicholas
Coronadas
B. S. Luc
Chorai
Toguaco
Zibirijoa
Loreto
Mochicahui
S. Michel
Concho
Carmen
Giganta
de Danzantes
Farellon
B. de S. Marie
rt de Malanzas
CINALOA

Having given an Account of the State of Religion in this new Colony, I proceed to relate what we obſerved concerning the Cuſtoms and Diſpoſitions of theſe People, their Manner of living, and the Product of their Country.

The Air of California.

California is pretty well placed in our common Maps. The Heats in Summer are very great along the Sea-Coaſts, and it ſeldom rains; but the *Air* of the Inland Countries is more temperate, and the Heats not ſo exceſſive. It is the ſame in Winter proportionally. In the rainy Seaſon there are Floods; but when that is over, inſtead of Rain the Dew falls in ſuch Plenty every Morning, that one would think it had rained; which renders the Earth very fruitful. In the Months of *April*, *May* and *June*, there falls with the Dew a ſort of *Manna*, which congeals and hardens upon the Leaves of Reeds, from whence they gather it: It is as ſweet as Sugar, tho' not altogether ſo white.

The Climate muſt needs be healthy, if we may judge of it by our ſelves and thoſe that were with us: For during the Five Years we were in this Kingdom, we continued very well in Health, notwithſtanding the great Fatigues we underwent: And of the other *Spaniards* there died but two; one of which was a Woman, who occaſion'd her own Death, by imprudently bathing herſelf when ſhe was near lying in.

There are in *California* large Plains, pleaſant Vallies, excellent Paſtures at all times for great and ſmall Cattle; fine Springs of running Water, Brooks and Rivers, with their Banks cover'd with Willows, Reeds, and wild Vines. In their Rivers they have Plenty of *Fiſh*, eſpecially Cray-fiſh, which they keep in a kind of Conſervatories, till they have occaſion for them; three of theſe Conſervatories I have ſeen, that were very large and beautiful. There is alſo plenty of *Xicamas*, of a better Taſte than thoſe of *Mexico*. So that we may conclude *California* to be a very fruitful Country; On the Mountains there are all the Year long *Meſcales*, a Fruit peculiar to this Country; and in moſt Seaſons, large Piſtachio's of ſeveral ſorts, and Figs of different Colours. The Trees are very beautiful; and, amongſt others, that which the *Chinas* (who are the Natives of the Country) call *Palo Santo*, bears a great deal of Fruit; from this they draw excellent Frankincenſe.

Fiſh.

Fruit.

As this Country abounds in Fruit, it does no leſs in *Grain*; of which there are fourteen ſorts that the People feed on. They uſe the Roots of Trees and Plants, and, among others, thoſe of the *Yyuca*, to make their Bread of. There are excellent Skirrets; a ſort of red Strawberries, of which they eat plentifully; and Citrons and Water-Melons of an extraordinary Size. The Land is ſo good, that moſt Plants bear Fruit three times a Year: So that with ſome Labour in cultivating it, and Skill in managing the Water, they render the Country extremely fertile. Nor is there any ſort of Fruit or Grain, but what they gather in great abundance; which we experienc'd ourſelves: For bringing with us from *New-Spain* Corn, *Indian* Wheat, Peaſe, Lentils, *&c.* we ſowed them, and had a very plentiful Increaſe, tho' we had not any Cattle or proper Inſtruments to till the Ground.

Animals.

Beſides ſeveral ſorts of *Animals* that we knew, which are here in plenty, and are good to eat, as Stags, Hares, Coneys, and the like, we found two ſorts of *Deer*, that we knew nothing of: We call them *Sheep*, becauſe they ſomewhat reſemble ours in Make. The firſt ſort is as large as a Calf of one or two Years old: Its Head is much like that of a Stag; and its Horns, which are very large, like thoſe of a Ram: Its Tail and Hair are ſpeckled, and ſhorter than a Stag's; but its Hoof is large, round, and cleft as an Ox's. I have eaten of theſe Beaſts; their Fleſh is very tender and delicious. The other ſort of Sheep, ſome of which are white, and others black, differ leſs from ours: They are larger, and have a great deal more Wool, which is very Good, and eaſy to be ſpun and wrought. Beſides theſe Animals, that ſerve for Food, there are Lions, wild Cats, and many others of the like, as in *New-Spain*. We brought to *California* ſome Cows, and Store of ſmall Cattle, as Sheep and Goats; which would have increaſed very much, had not the Neceſſity we were once in, obliged us to kill the greateſt part of them. We likewiſe brought with us Horſes and Colts to ſtock the Country, and began to breed up Hogs; but as theſe do a great deal of Damage in the Villages, and the Women are afraid of them, we have reſolv'd to extirpate them.

Fowls.

As for *Fowls*, there are in *California* all that are in *Mexico* and *New-Spain*; as Pigeons, Turtle-Doves, Larks, Partridges of an exquiſite Taſte, and in great Quantities, Geeſe, Ducks, and many other ſorts both of River and Sea-Fowls.

Sea-Fiſh.

The *Sea* affords great Plenty of very good *Fiſh*: They take Pilchards, Anchovies, and Tunnies; which laſt they catch with their Hands on the Shoar. We often ſee Whales, and all Sorts of Tortoiſes. The Shoars are fill'd with Heaps of Shells, larger than thoſe of Mother of Pearl. The Salt that they have is not from the Sea, but out of Pits: It is as bright as Cryſtal, and ſo hard, that they are often forced to break it with Hammers. It is a very good Commodity in *New-Spain*, where Salt is ſcarce.

California has been known near theſe two Centuries; and its Coaſts are famous for the Pearl Fiſhery, which has made the *Europeans* ſo deſirous of eſtabliſhing a Trade here. It is certain, if the King would erect a Fiſhery here at his own Charge, he might draw great Advantage from it. Nor do I doubt but that there are Mines to be found in ſeveral Places, if they were ſought for; ſince the Country is under the ſame Degree as the Provinces of *Cinaloa*, and *Sonora*, where there are very rich ones.

Though Heaven has been ſo bountiful to the *Californians*, and the Earth brings forth for itſelf what it does not produce elſewhere without a great deal of Labour and Pains, yet they make no Eſteem of the Plenty and Riches of their Country; contenting themſelves with what is only neceſſary for Life, they take little Care for the reſt. The Inland Parts of the Country are very populous, eſpecially towards the North: And tho' there is ſcarce a Town but what has 20, 30, 40 or 50 Families in it; yet they have no Houſes, but defend themſelves from the Heat of the Sun in the Day-time under the Shade of the Trees, and of their Leaves and Branches make a ſort of Roof againſt the Inclemency of the Night. In the Winter they ſhut themſelves in Caves in the Earth, and live there together little better than like ſo many Beaſts.

The Men. The *Men* go naked; at leaſt all were ſo that we ſaw. They wear about their Head a fine Linnen Fillet, or ſort of Net-work; and about their Neck, and ſometimes about their Arms, for Ornament, Mother of Pearl in divers Figures, very finely wrought, and prettily intermixt with little round Fruits, ſomewhat like the Beads of a Chaplet. They have no other Arms than Bows and Arrows, and a ſort of Javelin, which they always carry in their Hand, either to kill their Game, or defend themſelves from their Enemies; for their Towns often make War upon one another.

The Women. The *Women* wear from their Waiſt down to their Knees a kind of Apron made of Reeds, very neatly wrought and matted together. They cover their Shoulders with the Skins of Beaſts, and wear about their Heads, like the Men, a very curious kind of Net-work; which our Soldiers find ſo convenient, that they make uſe of them to tie up their Hair with. They, as well as the Men, have Necklaces of Mother of Pearl, mixt with the Stones of ſome ſorts of Fruit and Sea-ſhells, hanging down to their Waiſt; and Bracelets in like manner of the ſame.

Spinning. The common Employment of both Men and Women is *Spinning*. They make their Thread of long Plants, which ſerve them inſtead of Hemp and Flax; or elſe of a Cotton-like Subſtance found in the Shell of ſome ſorts of Fruit. Of the finer ſort of Thread, they make the Ornaments above-mention'd; and of the coarſer Fiſhing-Nets, and Sacks or Bags of ſeveral Uſes. The Men moreover, of certain Plants, whoſe Fibres are very cloſe and thick ſet, and which they are very well ſkill'd in working, employ themſelves in making Diſhes, and other Kitchen Neceſſaries, of all Faſhions and Sizes. The ſmaller Pieces ſerve for drinking Cups; thoſe that are larger, for Plates and Diſhes, and ſometimes for Umbrello's for the Women; and the largeſt ſort for Baſkets to gather Fruit in, and ſometimes for Pans and Baſins to dreſs their Meat in: But they take care to keep them continually moving while they are over the Fire; for if the Flame catch them, they are ſoon burnt.

The Temper of the Californians. The *Californians* have a great deal of Livelineſs, and are naturally addicted to Raillery, as we found when we began firſt to inſtruct them: For if we committed any Error in their Language, they jeſted and made Sport at us. But after we were grown better acquainted and more familiar with them, if we committed any Faults, they civilly adviſed us of them. And if at any time we explain'd any Myſtery, or Point of Morality, not conformable to their Prejudices and Errors, they waited for the Preacher after Sermon, and diſputed againſt him with a great deal of Force and Wit: If we could give them god Reaſons for it, they liſten'd very attentively; and, when at laſt convinced, ſubmitted, and did accordingly. We have not found among them any Form of Government, Religion, or regular Worſhip. They adore the Moon, and cut their Hair (as I remember) in her Decreaſe, in honour of their Deity, which they give to their Prieſts, who employ it to ſeveral ſuperſtitious Uſes. Every Family makes Laws as they pleaſe, which is plainly the Reaſon that they are ſo often at War with one another.

Of a New Iſland *raiſed near* Santerini, *in the* Archipelago, May 12, 1707. *by Dr.* W. Sherard. n. 314. p. 67.

XXIII. 1.] I juſt now receiv'd a Letter from our Conſul at *Milo*, with the following Account of a New Iſland: That on the 12th of *May*, 1707, there began to riſe up an Iſland a Muſket-ſhot diſtant from the Iſland of *Santerini*, which continually increaſing from day to day in the ſame manner, and troubling the Sea, there roſe up ſeveral Rocks that fix'd themſelves to this Iſland, ſo that it was about half a Mile in Circumference on *June* 21. N. St. 1707.

—*from the* Paris *Gazette*, ibid.

2.] *From the* Paris Gazette, *dated* April 14, 1708. Conſtantinople, *Jan.* 4. 1708.] They write from the Iſland of *Santerini* in the *Archipelago*, about 28 Leagues North of the Town of *Candia*, of the firſt of *December* laſt, that there was ſprung up an Iſland from the Bottom of the Sea, which at that Place is very deep, formed of Stones caſt up by a *Vulcano* under Ground at the Bottom of the Sea, which has often produc'd the ſame Effects, and after the ſame Manner. In the Year 726, in the time of the Emperor *Leo Iſauricus*, there was form'd an Iſland on the North-ſide, call'd the *Burnt Iſland*, by Matter vomited up and heaped together by this *Volcano*. In the Year 1427, in the Month of *December*, this *Burnt Iſland* was increaſed by great Rocks, caſt up by ſubterraneous Fires. In the Year 1650, in the Month of *September*, the *Volcano* again took fire, and produced the ſame Effects, without forming any Iſland, but only a Shelf or Bank 10 Fathom under Water in the Sea, where it has no Bottom.

Laſtly, in the Month of *November* laſt, 1707, the *Volcano* made an Iſland, which is already two Miles in Circumference, and increaſes yet (this firſt of *December*) by Rocks and other New Matter that is thrown up. This Burning was preceded, as at all other times, by violent Shakings of the Earth, followed by a thick Smoak that roſe out of the Sea in the Day-time, and Flames in the Night, and accompanied with a terrible roaring under Ground. There is no Example of the Effects of any *Volcano* at Land like theſe in the Sea; and yet what renders them the more credible, is, that the Iſland of *Santerini* itſelf is almoſt all of it compoſed of burnt Rocks and Pumice-ſtones: It produces ſome ſorts of Grain, but has neither Rivers nor Springs, nor any other Water but what is ſaved in Ciſterns.

—*On the* ſame, *by Mr.* Bourguignon *taken from the* Memoirs *of the* Hiſtory *of Arts and Sciences at* Trevoux, *for* July, 1708. n. 317. p. 200.

3.] On *Monday* the 23*d* of *May*, O. S. 1707, at Sun-riſing, we obſerv'd between the two *Burnt Iſlands* (commonly call'd the *Little* and *Great Cameny*) ſomething which look'd like a floating Rock; which at firſt we thought might have been ſome Veſſel ſhipwreckt on that Coaſt, and ſeem'd as if it would in a little time be daſh'd to pieces againſt the *Leſſer Cameny*, that was hard by: On which ſome Mariners put out to ſee what it was, and brought us word that it was a Shoal, which began to ſpring up from the Bottom of the Sea, and was not as yet very plainly to be diſcern'd. The next Day ſeveral Perſons went out of Curioſity to ſatisfy themſelves, not eaſily believing what the Mariners related: But they were no ſooner got to the Place, than their Eyes fully convinced them that it was Matter of Fact. Some of 'em were ſo bold as to get aſhoar on this new Shoal, which was ſtill moving, and ſenſibly increaſing under their Feet. They brought us back ſeveral Curioſities, and among others a kind of Oyſters, very large, and of an exquiſite Taſte, which they found ſticking to the Rock, and raiſed out of the Water, as the Shoal had increaſed in Height. Above all I obſerved a ſort of Stone, that at firſt ſight look'd much like Biſket, but in reality was nothing but a very fine Pumice-ſtone, ſurpaſſing all that I ever ſaw in *France*, or any other Parts of *Europe*.

Two Days before the ſpringing up of this Shoal, on the 21*ſt*, between twelve and one at Noon there was an Earthquake over the whole Iſland; which we cannot reaſonably attribute to any other Cauſe than the riſing up of this Maſs of Rock. From its firſt Appearance, to the 13*th* or 14*th* of *June*, it has continually increaſed very ſenſibly, as well in Bigneſs as Height, without any Noiſe.

This Shoal is very pleaſant to look on, of a white Colour, and round Figure. The Earth that it is compoſed of is light, with a ſmall Mixture of Clay. This new Iſland, according to the Report of ſome learned and skilful Perſons that were upon it in the beginning of *June*, is half a Mile in Circumference, and from 20 to 25 Foot high. Its increaſing for 4 or 5 Days was not ſo ſenſible as before, inſomuch that moſt were perſuaded that it had entirely ceaſed: Every body then thought themſelves ſafe, and that there was nothing further to be fear'd; but they were afterwards convinced of the contrary. For the Sea, already much troubled by the raiſing up of this Maſs of Earth, appeared more troubled every Day than other; not ſo much by reaſon of this Shoal lately removed, and ſtill floating, as on account of the Mixture of a vaſt Quantity of different Matters continually thrown up Night and Day from the Bottom of the Sea; ſo that one might eaſily diſtinguiſh ſeveral ſorts of Minerals by the Diverſity of Colours they made on the Surface of the Water; but Sulphur was in greateſt abundance, inſomuch that the Sea was coloured with it about *Santerini*, to near 20 Miles diſtance. The exceſſive rolling of the Waves about the new Shoal was greater than ever; and a more than ordinary Heat was ſenſible to any one that approach'd too near, which undoubtedly was the cauſe of ſuch Quantities of Fiſh being found dead on the Shoar. Every body perceived a horrible Stench, that infected the neighbouring Air; and which we our ſelves, tho' more than three Miles diſtant, often found of dangerous conſequence. The boiling of the Waters, which ſome before doubted of, proved now too true; and, inſtead of decreaſing, grew every day conſiderably greater. This ſtruck all People with a freſh Fear, and changed the Reſolution of thoſe, who were ſo bold before as to venture on this new Iſland. But their Fear was increaſed, when on *Friday*, *July* 16, at Sun-ſet, they perceived between this new Iſland and the *Leſſer Cameny*, as it were a Chain of black Rocks, that roſe up from a prodigious Depth of the Sea, to the number of ſeventeen or eighteen, not very diſtinct from one another, but ſeemed as if they would ſhortly unite together, and join themſelves to this new Iſland, as they actually did ſome few days after. Next day, being *Saturday*, we ſaw them plainer; and thoſe whoſe Tops we could only ſee the Night before, now appeared extraordinary large. On *Sunday* we firſt perceived Smoak to break forth, much reſembling, in Thickneſs and Colour, that of a burning Furnace; and at the ſame time heard certain Murmurings under ground, which ſeemed to proceed from the Center of this new Iſland, as yet too deep in the Sea to be plainly diſtinguiſhed.

Every body then was more frighted than ever, and thought of nothing, but how they ſhould ſhelter themſelves from the approaching Danger, and avoid the Fire that they foreſaw in all likelihood would ſoon follow. Whole Families went for Refuge to the neighbouring Iſlands; and others contented themſelves only with changing their Habitations, and living in the open Country, thinking themſelves ſafer there. In the mean time, the Rocks abovementioned united together, and ſeemed already to form another Iſland diſtinct from the former. The Smoak appeared in greater abundance; and the Fire, which we ſo much dreaded, at laſt began to break forth about the 19*th* of *July*: It was ſo little at firſt, and of ſo dull a Colour, that few believed it to be really ſo; but afterwards increaſing by degrees, as the Iſland increaſed, and breaking out more and more, and in different Places, all were ſufficiently convinced of it.

It was no leſs frightful and amazing, than curious, to ſee every Night on the Top of this Mount, that Nature had lately formed a vaſt Number, as it were, of burning Furnaces, all of a bright Flame; in Order and Poſition not unlike thoſe Illuminations of the *Minarets*, which the *Turks* uſually make at certain times every Year. One Night at the End of *July*, about an Hour after Sun-ſet, as we were obſerving the different *Phænomena* of this new Iſland, there appear'd of a ſudden, in the middle Region of the Sky, a fiery Lance, ſeeming to come from Eaſt to Weſt; but it diſappearing again too ſoon, we could not exactly obſerve the Dimenſions of it. In the mean time the Burnt Iſland increaſed prodigiouſly, and extended it ſelf principally on the South and North Sides. The Sea alſo ſeemed much more diſturbed and loaded with Sulphur and Vitriol. The boiling of the Water was more fierce and violent: The Smoak thicker, and in greater abundance; and the Fire bigger and more frightful. But above all, a Stench, that infected the whole Country, grew ſo inſupportable, that Perſons of the ſtrongeſt Conſtitutions could ſcarce breathe in it; others, that were weaker, fell into frequent Faintings; and almoſt every body was ſeized with Vomitings. I could not then but imagine my ſelf on board ſome Man of War; where, at a general Diſcharge of all the Guns, the confuſed Stink of the Powder, Tar, and Stench of the Ship, eſpecially in foul Weather, often overcomes the ſtrongeſt Seamen. Juſt ſuch a nauſeous Stink we were forced to breathe in, without being able any ways to avoid it, or defend our ſelves from it. But as we were infeſted with it but at times, and as the Wind brought it; ſo it was ſometimes more in one Place than another, and more or leſs tolerable, as the Wind ſate. This ill Scent was very miſchievons: It ſpoiled moſt of the Vines; and a great Smoak, that roſe out of the midſt of this new Iſland like a Mountain, joining it ſelf to a thick Fog, that commonly hangs over *Santerini* when the Wind is at South, burnt and deſtroy'd, in the Beginning of *Auguſt*, in leſs than three Hours time, all the Fruit that was ripe, and ready to be gathered, eſpecially in ſuch Vineyards as lay moſt expoſed to the South. A few Days after I was obliged to go to *Naxus*, ſo that I was abſent 13 or 14 Days; in which ſhort Space of Time there was ſo great an Alteration in theſe two new Iſlands, that I ſcarce knew 'em again at my Return; ſo different they were from what I left them. The White one, that did not ſeem to increaſe any more, was now grown conſiderably higher; and the Black one was much longer. Both of them, tho' different in Colour, were now united together, and made but one Iſland, as they remain at this Time. The Fire and Smoak had made new Vent-holes, and the Noiſe under ground was more frequent and audible. They told me, that in my abſence they heard from the midſt of the Iſland as it were ſo many large Cannon ſhot off, and at the ſame Inſtant ſaw a great Quantity of burning Stones thrown into the Air: of which a few days after I was an Eye-Witneſs. I watched Day and Night theſe furious Diſcharges, which made the Doors and Windows of our Chambers ſhake, and ſometimes the very beſt-built Houſes; and ſaw more than once Stones all on fire darted into the Air out of ſight, and after fall again like a Bomb, and quench'd in the Sea at more than five Miles diſtance.

When theſe Diſcharges happen'd, which were as loud as thoſe of a Cannon, we commonly ſaw immediately a great Flaſh of Fire like Lightning; and after that, there ſprung up very ſwiftly a black and diſmal Smoak, mixt with Aſhes, and ſo prodigiouſly thick, that, when ſpread in the Air, it made a thick Cloud of ſeveral Colours; which, by degrees, diſſolving it ſelf in a fine Duſt, fell like Rain on all the neighbouring Country, and more particularly on our Iſland, where it was in ſuch abundance, that the Ground was often covered with it. The Noiſe grew ſtronger, and was louder than if ſix or ſeven Cannons had been diſcharged together: The Fire made it ſelf every Day more Vent-holes, and became more dreadful. We commonly ſate up the greateſt part of the Night to obſerve it.

Every Night Nature repreſented as great Variety of Scenes, as the Fire broke forth in different Forms. Sometimes burning Aſhes ſpread themſelves in the Air, like a Plume of Feathers, which falling again on the Shoal, made it appear all of a light Fire: Other times one would think it was actually the diſcharging of ſo many Mortar-pieces, which threw entire Rocks, like ſo many Bombs, capable of deſtroying the largeſt Ships; tho' for the moſt part theſe Stones were of a middle Size, but in ſuch Quantities, that I often ſaw this little Iſland all cover'd with them, and ſo pleaſantly illuminated, that one would never be weary of looking on it.

Theſe dreadful Diſcharges were leſs frequent at the End of *Auguſt*, but increaſed in *September*, were daily in *October*, and at this time are almoſt inceſſantly. 'Tis true, the Noiſe is not ſo loud; the Stones that are caſt up are not ſo big, nor ſo many, the Boiling and Diſorder of the Water is much abated; the Sea begins to recover its former Colour; the Stench, that was before inſupportable, has been very little for theſe ſix Weeks. Yet the Smoak grows every Day thicker, blacker, and in greater abundance: The Fire is more than ever, and ſeems ſometimes to ſtrike the very Sky: The ſubterraneous Noiſe is continual, and ſo violent, that it can't be diſtinguiſh'd from Thunder: Duſt and Aſhes fall daily on this our Iſland. The Countryman is dejected at the Loſs of his Corn, which, ſcarce ſprung out of the Ground, begins to fade already; and the Mariner, not ſo bold as before, contents himſelf with viewing it at a diſtance, ſince the loſs of a Bark of this Country, which going too near, took fire and was burnt.

This new Iſland grows every day more curious, more dreadful, and leſs acceſſible; and is ſo far from ceaſing to increaſe at the Approach of Winter, as ſome would perſuade us, that we ſee it continually increaſing on the South-Weſt ſide; where Nature ſeems as if ſhe labour'd to make a large Port, capable of holding all manner of Ships, which may one day render *Santerini* not ſo practicable as heretofore.

This is what I thought moſt remarkable, in relation to this New Iſland, from the firſt beginning of it, to this 20th of *November*. I have only this to add, that this new Shoal ſeems to be at preſent at leaſt three Miles in Circumference, and more than from thirty-five to forty Foot high.

—*on the* ſame, *by Father* Goree. *n.* 332. *p.* 354. Fig. 75.

4.] Among the Prodigies of Nature, we may very juſtly reckon an Iſland which roſe up from the Bottom of the Sea, about four Years ago, in the Bay, which makes the Harbour of the Iſle of *Santerini* in the *Archipelago*; eſpecially if we conſider the Situation, Manner, and all the other Circumſtances of the Formation of this new Iſland. For what can be more ſurprizing, than to ſee Fire not only break out of the Bowels of the Earth, but alſo to make itſelf a Paſſage through the Waters of the Sea, without being extinguiſhed? Or what can be more extraordinary, or foreign to our common Notions of things, than to ſee the Bottom of the Sea riſe up into a Mountain above the Water, and to become ſo firm an Iſland, as to be able to reſiſt the Violence of the greateſt Storms? I know that ſubterraneous Fires, when pent in a narrow Paſſage, are able to raiſe up a Maſs of Earth as large as an Iſland: But that this ſhould be done in ſo regular and exact a manner, that the Water of the Sea cannot any ways penetrate to, and extinguiſh them; that the Fire itſelf, after having made ſo many Vent-holes and Paſſages, ſhould notwithſtanding retain a Force ſufficient to raiſe up ſo great a Maſs; and in fine, after the Fire is extinct, that this great Maſs ſhould not fall or ſink down again thro' its own Weight, but ſtill remain of the ſame Height that the Fire had raiſed it: This is what to me ſeems more ſurprizing than any thing that has been related of Mount *Gibel*, *Veſuvius*, or any other *Volcano*.

Yet this is not the firſt time that theſe Prodigies in Nature have been ſeen at *Santerini:* For, if it be not true, that this Iſland itſelf, which was anciently call'd *Thera*, was in like manner raiſed out of the Sea (as *Pliny* aſſures us it was,) it is at leaſt moſt certain, that three other ſmall Iſlands (two of which lie within the Bay of *Santerini*, and the third a little without it) have been form'd and raiſed up above the Sea by ſubterraneous Fires.

The firſt of theſe Iſlands, which was anciently call'd *Hiera*, becauſe it was (as it is thought) dedicated to *Pluto*, is now named *Megali Kammeni*, that is to ſay, the *Great Burnt Iſland. Juſtin* (l. 30. c. 4.) ſpeaking of the firſt War of the *Romans* with the *Macedonians*, and of the two Months Truce which *Philip* King of *Macedon*, and Father of *Perſes*, then demanded, and which he obtained, according to *Salianus*, the 4th Year of the 145th Olympiad, and the 196th Year before the Birth of our LORD, tells us, that this Iſland roſe up from the Bottom of the Sea this very Year after an Earthquake. His Words are theſe: *Eodem anno inter Inſulas Theramenem & Theraſiam, medio utriuſque ripæ &*

maris ſpatio, terræ motus fuit; in quo, cum admiratione navigantium, repentè ex profundo cum calidis aquis inſula emerſit.

It became half as big again in the Year of our LORD 726, by the joining of another Iſland to it; which, according to the Relation of *Theophanes*, a *Greek* Author, cited by *Baronius*, roſe alſo out of the Sea, and raiſed itſelf exactly to the ſame Height as the Iſland *Hiera*, and united ſo well to it, that at this time there remains no other Mark of its joining, than only a Cleft or Fiſſure, which reaches from one end of the Iſland to the other, and in ſeveral Places is not half a Foot broad.

The ſame thing happen'd a ſecond time in the Year 1457, as appears by a *Latin* Inſcription upon a Marble at *Santerini*; but with this Difference, that the ſubterraneous Fire, after having raiſed to the Height of five or ſix Foot above the Water, a vaſt Quantity of Rocks, which formed a Space about a Mile in Circumference, open'd a Paſſage for the Sea-Water to enter, by which it was extinguiſh'd; and the middle of that Space remain'd ſo low, that the Sea flowing into it by a ſubterraneous Canal, made there a ſmall Lake, which continues to this day.

Fig. 75. As to the ſecond Iſland, which is a little without the Bay, and is call'd in *Greek Aſpronisi*, or the *White Iſland*, becauſe the Earth, with which it is cover'd, is white like Lime; *Pliny*, who liv'd in the time of the Emperor *Veſpaſian*, ſays that it roſe out of the Sea, and appeared in his time.

The third Iſland, which is the leaſt, and is called by the *Greeks Mikri Kammeni*, or the *Leſſer Burnt Iſland*, was formed in the Year 1573, according to the Relation of ſeveral old People, who learned it of their Anceſtors: And it is between this little Iſland and the *Great Kammeni*, that on the 23d of *May* (New Stile) in the Year 1707, at Break of Day, this new Iſland was firſt diſcover'd.

Five Days before it appear'd, *viz.* On the 18th of *May*, between one and two of the Clock in the Afternoon, there was at *Santerini* an Earthquake, which was not violent, and continued but a Moment: And the Night, between the 22d and 23d, there was alſo another, which was yet leſs ſenſible than the former.

It is natural to imagine, that it was then that the new Iſland firſt began to move and raiſe itſelf from the Bottom of the Sea: Yet if we conſider, that theſe two Earthquakes were not violent, and laſted but a Moment; and that the Bottom of the Sea was in this Place from 80 to 100 Fathom deep, it ſeems difficult to believe that in five Days time it could riſe to this height. What inclines me to think the contrary, is, that the Height it is at preſent above the Surface of the Sea, and which it did not arrive to in leſs than three Years time, is much leſs than that from the Bottom of the Sea to the Surface of the Water, as I ſhall ſhow. Add to this, that a long time before theſe Earthquakes, the Fiſhermen perceived an ill Smell every time they paſſed by that Place; which ſhows that the

Iſland had then begun to move: Notwithſtanding it is very certain, that there have not been any other Earthquakes at *Santerini*, than thoſe, which, 14 or 15 Years ago, continued for ſeveral Days, and were very violent. Howſoever it was, ſome Seamen diſcover'd this Iſland early in the Morning; but not being able to diſtinguiſh what it was, they imagined it to be ſome Veſſel that had ſuffer'd Shipwreck, and was driven thither by the Sea. They went immediately to it; but as ſoon as they found that it was a new Iſland, they grew afraid, and returning as haſtily back again, ſpread the Report over the whole Iſland; which was the more readily credited, becauſe all the Inhabitants knew, and ſeveral of them had themſelves ſeen, what happen'd in the Year 1650. There was then a new Iſland, like to the preſent, which between the Iſlands of *Santerini*, *Nio* and *Andro*, roſe up by means of ſubterraneous Fires, which cauſed ſeveral violent Earthquakes, accompanied with a roaring Noiſe under Ground, ſulphureous Exhalations, and inſupportable Stench, and a black Smoak, which roſe out of the Sea with Flames to the Height of 10 or 12 Cubits. The Sea was then ſo toſſed backwards and forwards by the terrible Shocks of the Earth, that it overflowed and deſtroyed 30000 Perches of Land in *Santerini*; and the Air was ſo infected with Exhalations which came from the Fire, that 25 Perſons, and a great many Beaſts were ſtifled. At laſt, when this Iſland had not above eight or ten Fathom of Water to riſe, ſo as to appear above the Surface of the Sea, the Force of the ſubterraneous Fire was ſo violent, as to open a Paſſage, before its time, by which the Water of the Sea entering in like a Torrent, extinguiſhed the Fire, and this Maſs of Earth and Stones did not riſe any higher.

How great ſoever the Fright of the Inhabitants of *Santerini* was at the firſt Sight of this new Iſland, yet a few Days after, not ſeeing any Appearance either of Fire or Smoak, ſome of them took a Reſolution to go and view the Situation of it: Which they did accordingly: and not imagining any Danger, went on Shore upon it. They paſſed from one Rock to another, upon which they met with ſeveral very remarkable Curioſities; among which we may reckon a ſort of white Stone, which cuts like Bread, and reſembles it ſo well in Form, Colour, and Conſiſtence, that were it not for its Taſte, any one would take it for real Bread. There was alſo a great Number of freſh Oyſters, which they found ſticking to the Rocks; which being very ſcarce in that Country, by reaſon of the Depth of the Sea, they got as many of them as they could.

While they were buſy about this, they perceived the Iſland move and ſhake under their Feet. This was ſufficient to make them leave it immediately. In ſhort, the riſing of the Iſland was viſible to the Eye, and it increaſed not only in Height, but alſo in Length and Breadth. Tho' it was already between 15 and 20 Foot high above the Sea, it could not yet be ſeen from the Mountain *Merovigli*, or the

Caſtle of *Scaro*, which ſtands upon the Shore, by reaſon the *Leſſer Kammeni*, above-mentioned, lay between, and hinder'd the Sight: But at 15 Days end, they began to ſee it from *Merovigli*, and in a few Days after from the Caſtle of *Scaro*, ſituated upon another Mountain, which though it be very high, in reſpect to the Sea, yet it is much lower than that of *Merovigli*, to which it joins. From whence we may judge how much this new Iſland grew in Height in a few Days.

As the Motion, by which this Iſland increaſed every Day in Height, was ſometimes equal, and at other times unequal, in reſpect to all the Parts of ſo great a Maſs; ſo it did not always riſe equally on every Side. It often happen'd, that while it grew in Height and Length on one Side, it ſunk down and decreaſed on the other. I one day ſaw a Rock riſe out of the Sea, at 40 or 50 Paces diſtant from the Iſland, which I continued to obſerve for four Days together; at the end of which time it ſunk again into the Sea, and did not appear any more: But this was different from what happen'd to ſome others; which having diſappear'd, as this did, they re-appeared again ſome time after.

The *Leſſer Kammeni*, which lies very near, was often ſhaken with the Motion which raiſed this new Iſland. From a ſmall Cleft, which we obſerv'd upon the Top of this little Iſland, ſometimes Stones would break looſe; which rolling down its Sides into the Sea, would raiſe as it were a Cloud of Duſt, which ſome People took to be Smoak, but in reality it was not ſo.

At this time, the Sea, which is contain'd within the Gulph or Bay of *Santerini*, ſeveral times changed its Colour: At firſt it appear'd green, afterwards reddiſh, and ſome time after of a yellowiſh Colour; with a Stink, which ſpreading itſelf over great Part of *Saterini* made us imagine that this Colour proceeded from nothing elſe but the Sulphur with which the Sea was cover'd.

The Smoak appeared firſt upon the 16th of *July*: At which time, from a Place in the Sea, where (they aſſured me) they could never before find any Bottom, and which was above ſixty Paces diſtant from the new Iſland (which they then called the *White Iſland*) there aroſe up a Ridge of black Stones, which the *Greeks*, by reaſon of their Hardneſs, call *Sideropetres*, or Iron Stones, which formed another Iſland, named by the Inhabitants the *Black Iſland*; and which was afterwards not only the Center of the whole Iſland, but alſo of the Fire and Smoak, and great Noiſe that was heard ſome time after.

The Smoak, which iſſued out of this Ridge of Stones, or Black Iſland, was very thick and white, as if it had proceeded from five or ſix Lime-Kilns joined together; and being carried by a North Wind towards the Caſtle of *Acrotiri*, it went into the Houſes of the Inhabitants, but without cauſing any great Annoyance, becauſe it had no very ill Smell. Four Days after the Smoak had thus appear'd, they ſaw in the Night-time Fire iſſuing out from the ſame Place.

It was then that the Inhabitants of *Santerini*, and eſpecially thoſe of the Caſtle of *Scaro*, began to be afraid. They conſidered that their Caſtle was ſituated upon a Promontory, that was very narrow, and near to the Black Iſland; and that the time drew near, in which they muſt expect it either to be blown up into the Air, or overturn'd by ſome Shock of the Earth. They had continually before their Eyes Fire and Smoak; and this diſmal Spectacle made them apprehend, that there might be ſeveral Mines of Vitriol and Sulphur in the Iſland of *Santerini*, which would ſoon take fire; and that therefore the ſafeſt way for them was to abandon the Country, and retire to ſome other Iſland. And ſome took this Reſolution; and there was no other way left to ſatisfy the reſt, but by telling them, that if they would retire further into the Country, they would be ſafe there; and that if the Caſtle was in danger, yet they muſt neceſſarily ſee the *Leſſer Kammeni* firſt entirely deſtroyed, not only becauſe it lay between the Caſtle and the Black Iſland, but alſo becauſe it was much nearer to it than to the Caſtle.

The *Turks*, who were then at *Santerini* collecting the Tribute which this Iſland pays yearly to the *Grand Signior*, were not leſs afraid than the other People. Being amazed to ſee Fire break out of the Sea where it was ſo deep, they intreated the Chriſtians to pray to God, and eſpecially to make their young Children cry *Kurie Eleeſon*; becauſe, as they ſaid, the Children not having offended God, they could more eaſily appeaſe his Anger than older Perſons. The Fire was then but very little, being not above the Breadth of the Mouth of a Furnace, and did not appear in the Day-time, but only in the Night, from Sun-ſetting to Sun-riſing; and was ſo far from ſpreading the whole Length of the Ridge of Stones above-mention'd, that it poſſeſs'd but one ſmall part of it, which was always afterwards the common Paſſage for the Smoak and Fire.

As for the firſt Iſland, or White Iſland, we did not ſee there either Fire or Smoak; yet it continued to grow bigger; but the Black Iſland increaſed much faſter. We ſaw every day great Rocks riſe up on every ſide of it, which made it ſometimes longer, and at other times broader; and by the Height of them we could very nearly judge how many Foot it roſe up every Day or Night. Sometimes theſe Rocks joined to the Iſland, and at other times they were at a diſtance from it; ſo that in leſs than a Month, there were four little black Iſlands, which in a few days after united together, and made but one Iſland.

As the Smoak increaſed very much, and there was no Wind ſtirring, it roſe up to the middle Region of the Air, ſo as to be ſeen at *Candia*, *Naxos*, and other Iſlands; and in the Night-time it appear'd of a Flame to 15 or 20 Foot high. The Sea was at that time covered with a Matter or Froth, which in ſome places was reddiſh, and in others yellowiſh; from whence there proceeded ſo great a Stench over the whole Iſland of *Santerini*, that for fear of being infected, ſeveral Perſons were obliged to burn Incenſe, and others to make Fires upon the Tops of their Houſes, to diſperſe it, and to purify the Air. It did not continue above a Day and a half; for a ſtrong South-Weſt Wind aroſe, which, together with the Motion of the Sea, did indeed diſperſe this frothy Matter, but occaſioned otherways a great Damage to the beſt part of the Iſland of *Santerini*. At that time they were in great Hopes of having ſhortly a very plentiful Vintage; when this Wind carried all the Smoak upon their Vineyards, which burnt them up in ſuch a manner, that the Grapes (which were not yet ripe) turned in one Night's time like dried Raiſins, ſo that they were forced afterwards to throw them away, becauſe of their Sourneſs.

Nor was this the only Effect occaſion'd by this thick Smoak; for it is farther remarkable, that Silver and Copper were changed black by it: And tho' ſome People, who were forced to paſs thro' the Smoak in going to their Houſes, aſſured me, that it had no very ill Smell with it; yet ſeveral of them were, that and the next day after, troubled with great Pains of their Head. At this time the White Iſland, which ſeemed to be above the *Leſſer Kammeni*, and could be ſeen from the firſt Floor of the Houſes in the Caſtle of *Scaro*, ſunk down ſo low, that it could not be ſeen from the ſecond.

Hitherto the Sea had not been obſerved to boil up, or any Noiſe heard upon the Black Iſland: But upon the 31ſt of *July*, the Sea was ſeen to emit Smoak at two ſeveral Places; one of which was about 30, and the other above 60 Paces diſtant from the Iſland. In theſe two Places, both of which were perfectly round, the Water of the Sea looked like Oil, and ſeemed to riſe up and bubble: Which it continued to do for more than a Month; in which time there were a great many Fiſhes found dead on the Shore, occaſioned by their happening to have been too near theſe two Places.

The Night following there was heard a dull hollow Noiſe, much like that of ſeveral Cannons ſhot off at a diſtance: And at the ſame time there was ſeen to riſe out of the midſt of the Funnel, Flames of Fire, which darted very high into the Air, and diſappeared immediately. Next Day there was heard ſeveral Returns of the ſame Noiſe, which was followed by a Smoak, not white, as uſual, but blackiſh; and which, notwithſtanding a very freſh North Wind, roſe up in a moment to a prodigious height, in form of a Column, and in the Night-time would, in all probability, have appeared as if it were all on fire.

Auguſt the 7th, the Noiſe alter'd; and from being dull, as before, it became very loud, and reſembled the Noiſe which is made when ſeveral great Stones are thrown all together into a very deep Well: And I believe that this great Noiſe was occaſioned by ſeveral large Pieces of Rocks, which after having been raiſed up with the Iſland by the Violence of the Fire, broke off by reaſon of their Weight, and fell back again into the ſubterranean Caverns. What confirms me in this Thought, is, that I ſaw then the Ends of this Iſland in ſo great a Motion, that after having appear'd for ſome Days, they then diſappear'd, pear'd, and afterwards re-appear'd again a-new. Howſoever it was, this Noiſe after having continued ſo for near a Month, was followed by another much louder and more extraordinary: It ſo nearly reſembled Thunder, that when it did really thunder, as it happen'd to do three or four times, there was very little Difference between the one and the other.

As the Paſſage, which the Fire had made itſelf by its Violence thro' ſo many Rocks, was not, in all probability, in a ſtrait Line, and was in ſome Places narrower, and in others larger and more free; ſo it is probable that the Fire, or rather the ſulphureous and burning Exhalations, cauſed this great Noiſe, by turning from ſide to ſide in theſe winding Caverns, and endeavouring to get a Paſſage out, which was difficult for them to find: Which was the Cauſe that the Noiſe of this ſubterraneous Thunder was ſometimes not ſo loud, and a little while after grew more violent, and ſometimes was ſo ſtunning, that People talking together could ſcarce hear one another ſpeak; and that the Black Iſland, which was already very high, ſeemed to crack on every ſide; and in ſhort, that the incloſed Fire, after ſeveral Windings and Turnings, having collected a ſufficient Force, was able to break out with a noiſe equal to that of ſeveral Cannons diſcharged at once.

Auguſt 21. The Smoak diminiſh'd conſiderably, as alſo the Fire: There did not appear any in the Night; but the next Day both returned with greater Force than at any time before. The Smoak was reddiſh and very thick, and the Fire ſo great, that the Water of the Sea ſmoak'd, and bubbled up all round the Black Iſland. In the Night I view'd with a Teleſcope the great Fire that appeared upon the Mountain of this Iſland, and I number'd 60 Openings or Funnels, which threw out all of them a very bright Fire, and were divided from one another by Rocks. In all Probability there were others, and perhaps as many on the other ſide of the Mountain, which I could not ſee. Next Morning I obſerv'd that the Iſland had been very much raiſed in the Night; that a Range of Rocks about 50 Foot long was roſe out of the Water, which made the Iſland broader than it was before; and that the Sea was almoſt covered over with the reddiſh frothy Matter above-mention'd. This Matter, or Froth, appeared upon the Sea every time that the Iſland increaſed conſiderably, and occaſioned a Stink, much like that of the Sink of a Ship: Which we may imagine to ariſe from a ſlimy Earth mixed with Sulphur, which being raiſed up with the Rocks, and coming to be waſhed off by the Waves, was looſened and diluted by the Water, and ſo ſent up to the Surface the Salts with which it was loaded.

The Fire had hitherto appeared but only in one Place, upon the top of the Black Iſland; but on the *5th* of *September* it made it ſelf another Paſſage, and appeared at the End of that Iſland, on the ſide next *Teraſia*, which is another Iſland, which ſome Authors ſay was formerly joined to that of *Santerini*, and was ſeparated from it, by an Earthquake. The Fire did not continue at this End but a few days, during which it decreaſed at the Place whence it uſed commonly to iſſue out. And here we ſaw the Fire three ſeveral times dart out from this Place without any Noiſe, and riſe up in the Air like a large Rocket. The following Days there was much the ſame Spectacle; for the ſubterraneous Thunder, after having made a great noiſe, broke out from time to time with a Clap as loud as that of a Cannon, and was accompanied with a very beautiful and large Fire, which ſhooting up in an Inſtant to a great height, fell again on the Iſland, and illuminated it almoſt all over. I cannot better repreſent the Figure that the Fire made in the Air, than by comparing it to a certain artificial Fire-work I have ſeen in *France*, and is there called the *Gerbe:* But with this Difference notwithſtanding, that this Fire, of which I am ſpeaking, roſe much higher, and was much larger, but not ſo diſtinct as that of the *Gerbe.* And immediately after the Fire was darted out in the manner of a Rocket. there appeared in the Air a Blaze, in the form of a long fiery Sword, which continued ſome time, without moving, over the Caſtle of *Scaro*, and afterwards diſappeared.

At that time alſo, the White Iſland and the Black Iſland, having increaſed in Length, in proportion as they roſe in Height, united together; and the End of the Black Iſland, towards the South-Eaſt, began not to increaſe any more either in Height or Length, while the End toward the Weſt increaſed very ſenſibly to the Sight: Which makes me imagine, that the Mine of Sulphur being at this Place, and the Fire not finding any Paſſage out here, had force to raiſe up this Part, and not the other; for in the middle of the Iſland it always found Openings to iſſue out at, together with the Smoak. It had then four Paſſages there, which were ſo near one another, that one could not well diſtinguiſh them aſunder but by the Smoak: I do not mean that Smoak which commonly iſſued out, and was continual, but that which roſe up at ſome certain times with a great Force; for this Smoak came forth ſometimes from one Paſſage, and ſometimes from another, and ſometimes out of all four together; ſometimes with a great Noiſe, and at other times without any Noiſe at all, tho' then alſo it iſſued out with the ſame Impetuoſity.

Out of theſe Paſſages alſo there came a whiſtling Noiſe, like that of an Organ Pipe, with Variety of Sounds.

One would think that the Noiſe of this Thunder ſhould not then be ſo loud, by reaſon of the ſeveral Paſſages of which I have ſpoken; yet, notwithſtanding, it was not at any time ſo great and ſo frequent as it was then, and as it was above ſix Months after. It was then like the Report of a Cannon: And there did not paſs a Day or a Night, but we heard five or ſix, ſometimes 10 or 12 of 'em; and at the ſame time ſeveral great burning Stones were thrown into the Air; ſome of which falling one day upon the *Great Kammeni*, ſet fire to ſome Thickets of Buſhes upon that little Iſland; and others being caſt a great way into the Sea, had certainly deſtroyed a ſmall Veſſel that paſſed by at above a Mile's diſtance, if it had gone by never ſo little later. Theſe Claps were alwys attended with this Smoak I have mention'd, which was very different from that which iſſued out continually from the Gulph of Fire almoſt in the middle of the Iſland; for this was much thicker and blacker, and roſe in an inſtant much higher, and was not diſperſed till ſome time after, and then fell in Aſhes upon the Country, or into the Sea; ſome of which the Wind ſometimes carried as far as *Anacuphi*, an Iſland about twenty-five Miles diſtant from the Bay of *Santerini*.

Some Perſons had the Curioſity to gather ſome of theſe Aſhes, (which were of a Colour between black and white) and put them into the Fire, imagining they would burn like Gun-powder, which they very much reſembled; but they produced no other Effect, than only making a ſmall hiſſing Noiſe.

September the 18th, two Hours after Midnight, there was an Earthquake at *Santerini*, with which they were the more ſurprized, becauſe they leaſt ſuſpected it; the ſubterraneous Fires having had ſo free a Paſſage for ſo long a time, it did not do any Damage, and had no other Effect than to enlarge very much the Iſland, and to remove for ſome Days the Fire and Smoak into other Places, through new Paſſages which it made, and to increaſe very conſiderably both of 'em: And I never ſaw ſo much Fire, or heard ſuch terrible Claps, as after this Earthquake. By the Violence of theſe Claps, Houſes were ſhaken at above three Miles diſtance; and out of the midſt of a great Smoak, which roſe up and appear'd like a Mountain, one might ſee and hear great Pieces of Rocks fall down into the Sea and upon the Iſland, which were thrown out with the ſame Violence and Noiſe, as a Bullet out of the Mouth of a Cannon.

The *Leſſer Kammeni* was ſeveral times quite cover'd over with great Stones cover'd with burning Sulphur; ſeveral of which rolling afterwards from the Top of this little Iſland into the Sea, made a very bright Light and pleaſant Appearance in the Night. I thought at firſt, that the Fire had paſſed under ground from the new Iſland to this, becauſe they are not very far aſunder: But I ſoon found my Miſtake, and that this Fire proceeded only from theſe Stones ſulphur'd over; for the Sulphur with which they were cruſted over, being conſumed, they were all extinguiſh'd in half a quarter of an Hour's time, except ſome few which remained light above half an Hour. One day, when the *Leſſer Kammeni* was all on fire, after one of theſe furious Claps, and the Air was ſo too, thro' the frequent Flaſhes of Fire that appear'd in the Clouds, we ſaw, by a ſurprizing Accident, three Flaſhes come out of the Places where the Fire was, which one could not diſtinguiſh from real Lightning, but that they were formed lower, and were at the two Ends of the Iſland. By the Violence of one of theſe Claps, part of the Top of the new Iſland was carried off into the Sea, and ſeveral Stones were thrown to above two Miles diſtance: And, as if the Mine had been exhauſted by this great Clap, three or four days paſſed without any Noiſe, and almoſt without any Fire or Smoak. They thought then that they ſhould have ſeen an End of it; but the Fire kindled again, and the Iſland became more terrible than before. I was then at a Village ſix Miles diſtant; where we heard ſo diſtinctly (notwithſtanding it lay under a Mountain) the Blaſt of the Mine, that the Inhabitants were terribly frighted at ſuch an extraordinary Clap. At my Return to the Caſtle of *Scaro*, I found the People much more alarmed than they were in the Village; and was informed immediately, that the Caſtle had ſuffered ſo violent a Shake, that the Doors of the Houſes, and the Windows that were ſhut, were opened by the Force and Violence of the Clap.

February the 10*th*, 1708, at half an Hour after Eight of the Clock in the Morning, there was another Earthquake at *Santerini*; and ſome Perſons aſſured me, that there was another the Night before, but not ſo ſenſible as this. If we may judge by what is paſt, our *Volcano* is ſo far from drawing ſhortly to an End, that it gets new Force by other Veins of Sulphur which take fire at a greater diſtance. We have Inſtances of this in the Fire and Flames which riſe ſo frequently into the Air, and fall again over the whole Iſland, making in the Night-time as fine a Spectacle as was ever ſeen in artificial Fire-works. Beſides this, ſeveral great Rocks joining to the Iſland, which before were even with the Water, have been raiſed much higher; and the Noiſe, Smoak, and boiling of the Sea, increaſe ſo much, that tho' the Inhabitants of *Santerini* have been ſo long accuſtomed to ſee all theſe things, yet they could not help being more afraid than before. And not without Reaſon; for the ſubterraneous Noiſe was more violent than ever, and continued ſeveral Days together without any intermiſſion; and in the ſpace of a Quarter of an Hour the Mine diſcharged itſelf 5 or 6 times; the Noiſe of which, with the great Quantity of Stones it threw into the Air, the Shocks it gave the Houſes, and the Fire which appeared in open Day (which was never ſeen before) very much ſurpaſſes all that I have before ſpoken of it.

The 15*th* of *April* was remarkable above all other Days for the great Number and Violence of the Claps; by one of which, near 100 great Stones were mounted up all at once into the Air, and fell again at above two Miles diſtance in the Sea. Tho' I was then about three Miles off from the new Iſland, I obſerv'd one of a ſurprizing Greatneſs, which did not riſe ſo high as the reſt, but was driven farther, in a ſtrait Line, like a Cannon Ball. This happened to be *Eaſter-Day* (which was upon *April* the 4*th*, Old Stile, which is uſed at *Santerini*) and this Circumſtance contributed not a little to confirm ſeveral ignorant *Greeks* in the ridiculous Opinion they had, that this new Iſland was one of the Mouths of Hell; ſo that they did not ſcruple to ſay, that the Devils, not being able to bear that Day, as being jealous of the Glory of the Reſurrection of our Lord, had made all the Efforts that Day that was poſſible: And their Biſhop himſelf was ſo infatuated with this Opinion, as well as the reſt, that he ſpoke to me very ſeriouſly about it, and aſked me my Thoughts of it: But notwithſtanding whatſoever I could ſay to undeceive him, I found that he perſiſted in his Opinion, and would not be perſuaded otherwiſe.

From the 15th of *April* to the 23d of *May*, which was a Year from the Birth of this new Iſland, what I have deſcrib'd above, continued the ſame; and I did not obſerve any thing more in particular, unleſs it were that the Iſland increaſed in Height, and not in Length; and that one furious Clap beat down at once all the Top of it; which, by means of the Aſhes and Stones of all Sizes that fell upon it Day and Night, was not only repair'd but made much higher than it was before. All Particulars began to abate afterwards: The Smoak decreaſed; the ſubterraneous Noiſe was not ſo violent, and the Claps, tho' they were very frequent, were not however ſo loud, by reaſon that the Funnels, which gave a Paſſage to the Fire and Smoak, were then much larger than they were before.

Hitherto I had not been to ſee this Iſland but at a Diſtance, for fear the ſame ſhould happen to me, as to *Pliny*, when he went to ſee Mount *Veſuvius*; and leſt I ſhould be ſuffocated, as he was, with the Flames, or over-whelm'd with the Stones which this new Iſland threw out on every Side. But ſeeing that there was then no Danger, I went in Company with the Reverend *Francis Criſpa*, the *Latin* Biſhop of *Santerini*. And as our Deſign was to go aſhore upon it, if poſſible, we went directly to it; to do which, we were obliged to paſs over a Place, where the Sea ſmoak'd very much, but did not bubble. We were no ſooner come to this Place, but we perceived a Heat ſtrike upon our Faces; which was nothing elſe but the Fumes of the Sulphur, in the midſt of which we were at that time. One of the Perſons that were with us, who was naturally more timorous than the reſt, being ſurpriz'd at this Heat, and not knowing the Cauſe of it, aſked from whence it proceeded. The Seamen bid him and us put our Hands into the Water; which we did, and found it ſo very hot, that having taken them out again immediately, the Biſhop bid them make what Haſte they could away. We were then 500 Paces off from the new Iſland, and I had not time to ſound the Depth of this Place. From whence we went directly over to that Part of the Iſland where it had increaſed in Length, and where there is more Danger; for ſeeing that the Smoak was very thick, which ſhowed that there was a great Fire all thereabout, we did not think it ſafe to go any nearer, and ſo ſatisfy'd ourſelves with viewing only the Space that was between this new Iſland and the *Leſſer Kammeni*, which I found to be broader than I imagined, and judged that a Galley might paſs through the narroweſt Place of it. After this we went on ſhore upon the *Great Kammeni*, that we might from thence view nearer, and without any Danger, the whole burning Iſland, and eſpecially that Side of it which we could ſcarce ſee from the Caſtle of *Scaro*. From hence it was, that after having well examin'd all Particulars, we judged this new Iſland to be about 200 Foot in Height, 5 Miles in Circumference, and a Mile over at its broadeſt Part. As to the Form of it, it is oblong, and reſembles in ſome meaſure the Figure of a Dragon; as may be ſeen by Fig. 75. the Deſign of it, which I took from this Place.

After having tarried ſome time upon the *Great Kammeni* (where we often ſaw, not far off, a great many Stones thrown violently out of the Gulph of Fire, and fall down again with a terrible Noiſe upon the Iſland) we took a Reſolution to coaſt it round, and to go to the other End of it, not doubting but that we might get on ſhore there, becauſe that Part of the Iſland had not increaſed for ſeveral Months; and there did not appear any Fire or Smoak there. We were within a hundred Paces of it, when putting my Hand into the Water, I perceived that it was warm, and that the further we went the hotter it grew. At this Inſtant the Mine diſcharged itſelf; and the Wind drove upon us the thick Smoak, which broke out with great Violence every time the Mine took fire: And a Shower of Aſhes and little Stones, not larger than common Hailſtones, falling upon us, we were forced to quit our Deſign of going on ſhore upon the Iſland at this Place. This Shower of Stones and Aſhes being over, we retired a little, by reaſon of the great Heat of the Water; and letting down our Plummet, we had at this Place 95 Fathom of Water, without finding the Bottom, our Line not being long enough. Viewing afterwards the Space that was at this End between the Iſland and the *Leſſer Kammeni*, we found in ſeveral Places that it was narrower at this Side than at the other; and that if the new Iſland ſhould continue to grow bigger, ſeveral Rocks, which were already half above Water, and roſe up nearer to the *Leſſer Kammeni*, would in time ſhut up the Paſſage, and join both the Iſlands together, ſo as to make a little Port between 'em, which would be very commodious for the Shipping of *Santerini*. In returning afterwards to the Caſtle of *Scaro*, we paſſed by the little Port of the *Leſſer Kammeni*; and (by reaſon of its Nearneſs) could ſcarce believe what they there told us, *viz.* That they could not hear there any of the Noiſe that this new Iſland made: Which we found to be true, and that the Height of this little Iſland was the Cauſe of it.

During the reſt of the time that I tarried at *Santerini*, to the 15th of *Auguſt* 1708, (at which time I came away) the Smoak, Fire, Noiſe, &c. continued much the ſame as I have now deſcribed 'em; that is to ſay, they were always pretty moderate.

This is all that I can ſay of this *Phænomenon*; all the Circumſtances of which I have related ſo much the more faithfully, becauſe I was the only Perſon at *Santerini*, who kept a Journal of what happen'd every Day. From my leaving *Santerini*, to this preſent the 6th of *July*, 1711, I have received ſeveral Letters; and have ſeen and ſpoken with ſeveral Perſons who have come from thence within theſe few Days; and they all tell me, that the new Iſland grows ſtill in Length on that Side next *Teraſia*: That it is now about ſix Miles in

Compaſs: That as to the Fire and Noiſe under ground, they were more moderate than before; which makes the Inhabitants of the Iſland hope, that they ſhall ſhortly ſee an End of it.

When I conſider, that the Paſſages which give Vent to the Fire are very large, and almoſt in the Middle of the Iſland; and that there is no appearance that the Fire will ever make a Paſſage at the Bottom of the Sea, ſo as to let the Water in to extinguiſh it; I am of Opinion, that it may yet laſt longer than they imagine; and that this *Phænomenon* will not have an End till the Mine of Sulphur is entirely conſumed.

Of Luminous Appearances *in the* Wakes *of* Ships *in the* Sea, *by Father* Bourzes. *Taken from the* Letters *of the* Miſſionary Jeſuits, n. 337. p. 230.

XXIV. In my Voyage to the *Indies*, I made ſome Obſervations concerning thoſe Sparkles of Light which appear in the Night-time on the Surface of the Sea.

When the Ship ran apace, we often obſerved a great Light in the Wake of the Ship, or the Water that is broken and divided by the Ship in its Paſſage. Thoſe, that did not view it nearly, often attributed it to the Moon, the Stars, or the Lanthorn at the Stern; as I did my ſelf, when I firſt perceived it: But having a Window that look'd directly down upon it, I was ſoon undeceived; eſpecially when I ſaw it appear more bright when the Moon was under the Horizon, the Stars covered with Clouds, and no Lights in the Lanthorn, or any other Light whatſoever caſt upon the Surface of the Water.

This Light was not always equal; ſome Days it was very little, others not at all; ſometimes brighter, others fainter; ſometimes it was very vivid, and at other times nothing was to be ſeen.

As to its *Brightneſs*, I could eaſily read by it, tho' I was nine or ten Foot above it from the Surface of the Water; as I did particularly on the 12*th* of *June*, and the 10*th* of *July*, 1704. But I could read only the Title of my Book, which was in large Letters.

As to the *Extent* of this Light, ſometimes all the Wake appeared luminous to thirty or forty Foot diſtant from the Ship; but the Light was very faint at any conſiderable diſtance.

Some days one might eaſily diſtinguiſh in the Wake ſuch Particles as were luminous from thoſe that were not: At other times there was no Difference. The Wake ſeemed then like a River of Milk, and was very pleaſant to look on; as it appear'd particularly on the 10*th* of *July*, 1704.

At ſuch times as we could diſtinguiſh the bright Parts from the others, we obſerved that they were not all of the ſame Figure. Some of 'em appear'd like Points of Light; others almoſt as large as Stars, as they appear'd to the naked Eye. We ſaw ſome that looked like Globules of a Line or two in Diameter; and others like Globes as big as one's Head. Oftentimes theſe *Phoſphori* form'd themſelves into Squares of three or four Inches long, and one or two broad. Sometimes we could ſee all theſe different Figures at the ſame time; and particularly, on the 12*th* of *June*, the Wake of the Veſſel was full of large *Vortices* of Light, and theſe oblong Squares which I have been ſpeaking of. Another day, when our Ship ſailed ſlowly, the *Vortices* appeared and diſappeared again immediately like Flaſhes of Lightning.

Not only the Wake of a Ship produces this Light, but *Fiſhes* alſo in ſwimming leave behind 'em a luminous Track; which is ſo bright that one may diſtinguiſh the Largeneſs of the Fiſh, and know of what Species it is. I have ſometimes ſeen a great many Fiſhes playing in the Sea, which have made a kind of artificial Fire in the Water, that was very pleaſant to look on. And often only a Rope placed croſs-wiſe will ſo break the Water, that it will become luminous.

If one takes ſome Water out of the Sea, and ſtirs it never ſo little with his Hand in the dark, he may ſee in it an infinite Number of bright Particles.

Or if one dips a piece of Linnen in Sea-Water, and twiſts or wrings it in a dark place, he ſhall ſee the ſame thing; and if he does ſo, tho' it be half dry, yet it will produce abundance of bright Sparks.

When one of the Sparkles is once formed, it remains a long time; and if it fix upon any thing that is ſolid, as for inſtance on the Side or Edge of a Veſſel, it will continue ſhining for ſome Hours together.

It is not always that this Light appears, tho' the Sea be in great Motion; nor does it always happen when the Ship ſails faſteſt: Neither is it the ſimple beating of the Waves againſt one another that produces this Brightneſs, as far as I could perceive. But I have obſerved, that the beating of the Waves againſt the Shore has ſometimes produced it in great plenty; and on the Coaſt of *Brazil* the Shore was one Night ſo very bright, that it appeared as if had been all on fire.

The Production of this Light depends very much on the Quality of the Water; and, if I am not deceiv'd, generally ſpeaking, I may aſſert, other Circumſtances being equal, that the Light is largeſt when the Water is fatteſt and fulleſt of Foam; for in the main Sea the Water is not every where equally pure; and ſometimes if one dips Linnen into the Sea, it is clammy when it is drawn up again. And I have often obſerved, that when the Wake of the Ship was brighteſt, the Water was more fat and glutinous; and Linnen moiſten'd with it produced a great deal of Light, if it were ſtirr'd or mov'd briſkly. Beſides, in ſailing over ſome Places of the Sea, we find a Matter or Subſtance of different Colours, ſometimes red, ſometimes yellow. In looking at it, one would think it was Saw-duſt: Our Sailors ſay it is the Spawn, or Seed of Whales. What it is, is not certain; but when we draw up Water in paſſing over theſe Places, it is always viſcous and glutinous. Our Mariners alſo ſay, that there are a great many Heaps or Banks of this Spawn in the North; and that ſometimes in the Night they appear all over of a bright Light, without being put in motion by any Veſſel or Fiſh paſſing by them.

But to confirm farther what I ſay, *viz.* That the Water, the more glutinous it is, the more it is diſpoſed to become luminous; I ſhall add one Particular which I ſaw my ſelf. One day we took in our Ship a Fiſh, which ſome thought was a *Boneta.* The Inſide of the Mouth of the Fiſh appeared in the Night like a burning Coal; ſo that without any other Light, I could read by it the ſame Characters that I read by the Light in the Wake of the Ship. Its Mouth being full of a viſcous Humour, we rubbed a Piece of Wood with it, which immediately became all over luminous; but as ſoon as the Moiſture was dried up, the Light was extinguiſh'd.

I leave it to be examin'd whether all theſe Particulars can be explained by the Syſtem of ſuch as aſſert, that the Principle of this Light conſiſts in the Motion of a ſubtle Matter, or Globules, cauſed by a violent Agitation of different kinds of Salts.

—Of Rain-bows, *&c.*

I ſhall add one Obſervation more concerning Marine Rain-bows, which I obſerved after a great Tempeſt off of the Cape of *Good Hope.* The Sea was then very much toſſed, and the Wind carrying off the Tops of the Waves made a kind of Rain, in which the Rays of the Sun painted the Colours of a Rain-bow. It is true the common *Iris* has this advantage over ours, that its Colours are more lively, diſtinct, and of longer Extent. In the Marine *Iris* we could diſtinguiſh only two Colours, *viz.* a dark Yellow on that ſide next the Sun, and a pale Green on the oppoſite ſide: the other Colours were too faint to be diſtinguiſh'd. But theſe *Iris's* are in a greater number; one may ſee 20 or 30 of 'em together; they appear at Noon-day, and in a Poſition oppoſite to that of the common Rain-bow, that is to ſay, their Curve is turned as it were towards the Bottom of the Sea.

I ſhall add only a word or two concerning *Exhalations* in the Night, that form in the Air a long Track of Light. Theſe Exhalations make a Track of Light much larger in the *Indies* than they do in *Europe.* I have ſeen two or three that I ſhould have taken for real Rockets: They appear'd near the Earth, and caſt a Light like that of the Moon ſome days after her Change. They fall ſlowly, and in falling make a curve Line; eſpecially one which I ſaw on the main Ocean, at a great diſtance off at Sea, on the Coaſt of *Malabar.*

XXV. *Accounts of Books Omitted.*

n. 311. *p.* 2433.

1. A *Voyage* to the Iſlands of *Madera, Barbadoes, Nevis, St. Chriſtopher's* and *Jamaica:* With the Natural Hiſtory of the *Herbs* and *Trees, Four-footed Beaſts, Fiſhes, Birds, Inſects, Reptiles,* &c. of the laſt of thoſe Iſlands. To which is prefix'd an Introduction, wherein is an Account

of the *Inhabitants*, *Air*, *Waters*, *Diſeaſes*, *Trade*, &c. of that Place, and ſome Relations concerning the neighbouring Continent, and Iſlands of *America*. Illuſtrated with the *Figures* of the Things deſcrib'd, which have not been heretofore engrav'd, in large *Copper Plates* as big as the Life. By *Hans Sloane*, M. D. Fellow of the *College* of *Phyſicians*, and *Secretary* of the *Royal Society*. Vol. I. *Folio*.

n. 316. p. 143. 4. *Itinera Alpina Tria*, &c. Authore *Joh. Jac. Scheuchzero*, M. D. Londini, 4*to*, MDCCVIII.

CHAP. IV.

Miſcellaneous Papers.

An Attempt to find the Age *of the* World *by the* Saltneſs *of the* Sea, *by Dr.* E. Halley. n. 344. p. 296.

I. THERE have been many Attempts made to aſcertain, from the Appearances of Nature, what may have been the Antiquity of this Globe of *Earth*; on which, by the Evidence of Sacred Writ, *Mankind* has dwelt about 6000 Years; or, according to the *Septuagint*, above 7000. But whereas we are there told that the Formation of *Man* was the laſt Act of the CREATOR, 'tis no where revealed in Scripture how long the Earth had exiſted before this laſt Creation, nor how long thoſe five Days that preceded it may be to be accounted; ſince we are elſewhere told, that in reſpect of the Almighty a thouſand Years is as one Day, being equally no part of *Eternity*: Nor can it well be conceived how thoſe Days ſhould be to be underſtood of natural Days, ſince they are mentioned as Meaſures of Time before the Creation of the Sun, which was not till the fourth Day. And 'tis certain *Adam* found the *Earth*, at his firſt Production, fully repleniſhed with all ſorts of other *Animals*. This Enquiry ſeeming to me well to deſerve Conſideration, I ſhall propoſe an Expedient for determining the Age of the World by a *Medium*, as I take it, wholly new, and which in my Opinion ſeems to promiſe Succeſs, though the Event cannot be judged of till after a long Period of Time. What ſuggeſted this *Notion*, was an Obſervation I had made, that all the *Lakes* in the *World*, properly ſo called, are found to be *Salt*, ſome more, ſome leſs than the Ocean Sea, which in the preſent Caſe may alſo be eſteemed a *Lake*; ſince by that Term I mean ſuch ſtanding Waters as perpetually receive Rivers running into them, and have no Exit or Evacuation.

The Number of theſe Lakes in the known Parts of the World is exceeding ſmall: And indeed upon Enquiry I cannot be certain there are in all any more than four or five, *viz. firſt, the Caſpian Sea*; *ſecondly*, the *Mare Mortuum*, or *Lacus Aſphaltites*; *thirdly*, the Lake on which ſtands the City of *Mexico*; and *fourthly*, the Lake of *Titicaca* in *Peru*, which by a Channel of about fifty Leagues communicates with a fifth and ſmaller, call'd the Lake of *Paria*, neither of which have any other Exit. Of theſe the *Caſpian*, which is by much the greateſt, is reported to be ſomewhat leſs ſalt than the Ocean. The *Lacus Aſphaltites* is ſo exceedingly ſalt, that its Waters ſeem fully ſated, or ſcarce capable to diſſolve any more; whence in Summer-time its Banks are incruſtated with great Quantities of dry *Salt*, of ſomewhat a more pungent Nature than the *Marine*, as having a Reliſh of *Sal-Armoniac*, as I was inform'd by a curious Gentleman that was upon the Place.

The *Lake* of *Mexico* properly ſpeaking, is two Lakes, divided by the *Cauſeways* that lead to the *City*, which is built in Iſlands in the midſt of the *Lake* undoubtedly for its Security; after the Idea, 'tis probable, its firſt Founders borrowed from their *Beavers*, who build their Houſes on Damms they make in the Rivers after that manner. Now that Part of the *Lake*, which is to the Northwards of the *Town* and *Cauſeways*, receives a River of a conſiderable Magnitude, which being ſomewhat higher than the other, does with a ſmall Fall exonerate itſelf in the Southern Part, which is lower. Of theſe the lower is found to be ſalt, but to what degree I cannot yet learn, though the upper be almoſt freſh.

And the Lake of *Titicaca*, being near eighty Leagues in Circumference, and receiving ſeveral conſiderable freſh Rivers, has its Waters, by the Teſtimony of *Herrera* and *Acoſta*, ſo brackiſh as not be potable, though not fully ſo ſalt as that of the Ocean; and the like they affirm of that of *Paria*, into which the Lake of *Titicaca* does in part exonerate itſelf, and which I doubt not will be found much ſalter than it, if it were enquired into.

Now I conceive that as all theſe receive Rivers, and have no *Exit* or Diſcharge, ſo it will be neceſſary that their Waters riſe and cover the Land, until ſuch time as their Surfaces are ſufficiently extended, ſo as to exhale in Vapour that Water that is poured in by the Rivers; and conſequently that Lakes muſt be bigger or leſſer according to the Quantity of the Freſh they receive. But the Vapours thus exhaled are perfectly freſh, ſo that the ſaline Particles that are brought in by the Rivers remain behind, whilſt the freſh evaporates; and hence 'tis evident that the Salt in the Lakes will be continually augmented, and the Water grow ſalter and ſalter. But in Lakes that have an *Exit*, as the Lake of *Geneſaret*, otherwiſe call'd that of *Tiberias*, and the upper Lake of *Mexico*, and indeed in moſt others, the Water being continually running off, is ſupply'd by new freſh River Water, in which the ſaline Particles are ſo few as by no means to be perceived.

Now if this be the true Reaſon of the Saltneſs of theſe Lakes, 'tis not improbable but that the Ocean itſelf is become ſalt from the ſame Cauſe, and we are thereby furniſh'd with an Argument for eſtimating the Duration of all Things, from an Obſervation of the Increment of Saltneſs in their Waters. For if it be obſerv'd what Quantity of Salt is at preſent contain'd in a certain Weight of the Water of the *Caſpian Sea*, for example, taken at a certain Place, in the drieſt Weather; and after ſome Centuries of Years the ſame Weight of Water, taken in the ſame Place and under the ſame Circumſtances, be found to contain a ſenſibly greater Quantity of Salt than at the time of the firſt Experiment, we may, by the Rule of Proportion, make an Eſtimate of the whole Time wherein the Water would acquire the Degree of Saltneſs we at preſent find in it.

And this Argument would be the more concluſive, if by a like Experiment a ſmaller Increaſe in the Saltneſs of the *Ocean* ſhould be obſerved; for that, after the ſame manner, receives innumerable Rivers, all which depoſite their ſaline Particles therein; and are again ſupplied, as I have elſewhere ſhewn, by the *Vapours* of the *Ocean*, which riſe therefrom in Atoms of pure Water, without the leaſt Admixture of Salt. But the Rivers in their long Paſſage over the Earth do imbibe ſome of the ſaline Particles thereof, though in ſo ſmall a Quantity as not to be perceived, unleſs in theſe their Depoſitories, after a long Tract of Time. And if upon repeating the Experiment, after another equal Number of Ages, it ſhall be found that the Saltneſs is further increaſed with the ſame Increment as before, then what is now propoſed as *Hypothetical*, would appear little leſs than demonſtrative. But ſince this Argument can be of no uſe to ourſelves, it requiring very great Intervals of time to come to our Concluſion, it were to be wiſhed that the ancient *Greek* and *Latin* Authors had delivered down to us the Degree of the Saltneſs of the Sea, as it was about 2000 Years ago; for then it cannot be doubted but that the Difference between what is now found, and what then was, would become very ſenſible. I recommend it therefore to the *Society*, as Opportunity ſhall offer, to procure the Experiments to be made of the preſent Degree of Saltneſs of the *Ocean*, and of as many of theſe Lakes as can be come at, that they may ſtand upon Record for the Benefit of future Ages.

If it be objected that the Water of the *Ocean*, and perhaps of ſome of theſe *Lakes*, might, at the firſt beginning of Things, in ſome meaſure contain Salt, ſo as to diſturb the Proportionality of the Increaſe of Saltneſs in them, I will not diſpute it: But ſhall obſerve, that ſuch a Suppoſition would by ſo much contract the Age of the World, within the Date to be derived from the foregoing Argument, which is chiefly intended to refute the ancient Notion ſome have of late entertained,

tertained, of the Eternity of all Things; though perhaps by it the World may be found much older than many have hitherto imagin'd.

Two Deaf *Perſons who* Underſtand *what is ſaid to them by the* Motion *of the* Lips; by Mr. R. Waller, *n.* 312. *p.* 1468.

II. A Man and his Siſter are now alive, each about 50 Years old, neither of which have the leaſt Senſe of Hearing; they both live by their daily Labour; yet both theſe Perſons know, by the Motion of the Lips only, whatever is ſaid to them, and will anſwer pertinently to the Queſtion propos'd to them of any thing within their Capacity, and are both very intelligent, as far as can be expected from their Education. I remember ſeveral Years ſince, when this Man was then working in the Garden, Mr. *Colſon* and I ſtanding together, I took an Opportunity when the Fellow look'd on me, to aſk him ſome Queſtion or other, which he readily underſtood, and anſwer'd according to it; tho' Mr. *Colſon* that ſtood by me heard me ſay nothing; the Fellow underſtanding it only by the Motion of the Mouth, ſo that you need only whiſper, provided the Lips and Mouth be but moved as they ought, and you do not ſpeak too faſt. I many Years ſince enquired of his Mother, who has been long ſince dead, as to their Deafneſs; and ſhe told me, they could hear very well and ſpeak when they were Children, but both loſt that Senſe afterwards, which makes them retain their Speech: Tho' that to Perſons not uſed to them, is a little uncouth and odd, but intelligible enough, eſpecially the Man's. They were not Twins; and I knew two Brothers of the ſame Parents that had their Hearing as well as any Perſons whatever.

A Perſon that could neither Write *nor* Read, *yet could* caſt *up* Sums *with great* Exactneſs; *by Mr.* J. Locke. *n.* 278. *p.* 893.

III. I had yeſterday at *Rotterdam* (*March* 25, 1701.) a young Lad of 17 Years old, that can neither read nor write, that out of his Head will reckon any the moſt difficult Sums you can give him, even to the utmoſt Fractions, I gave him an Average to make of a Ship run aſhore, to ſave Ship and Goods were worth 13679,14; the Charges on the Salvage were 2931,16. I aſk'd him how much that was *per Cent.* he told me, after a little talking to himſelf, that it was 21 Gild. 9 St. and a ſmall Fraction; and ſo it is. I aſk'd him what 4943,3 2848,4, 2244,7, 2194,7, 544,19, 351,18, and 52,16 muſt pay reſpectively; he told me exactly to ſo many Stivers and $\frac{112}{160}$. I aſk'd him how he came by that Knowledge; he ſaid by ſelling Sea-Snails (*Alykreucken*) and Muſcles, for which he receiv'd nothing but Doits, and ſo he brought his Father home ſo many Doits; but could never tell how much Money they amounted to, till he aſk'd his Father how many Doits made a Gilder, and being 160, then he reckon'd how many in 10 and 100, and ſo from one thing to another; he has a Table of Multiplication in his Head of half a Yard long, or more. I tried him by a Table I have, and he anſwered me as readily as you can upon the ordinary Table of Multiplication. He wanders from Town to Town to ſee who has any thing to cypher, and ſo gets ſome Money; but would fain learn to read and write. This I mention, becauſe it is ſo prodigious; and he divides almoſt with as much eaſe as he multiplies, and reduces Things to the leaſt Denomination in Fractions.

A remarkable Skin *of a* Fiſh's Stomach, *by Mr.* R. Thoresby. *n.* 277. *p.* 1070. Fig. 76.

IV. I have in my *Muſæum* the outward Skin of the Maw of a Fiſh that was taken at *Macaſſar*, *Feb.* 1680-1. It was given me by Mr. *R. Midgley*, who had it from a *Dutchman* at *Batavia*; who took it out of the Fiſh.

The *Fibres* and Veſſels do curiouſly and naturally reſemble a Tree with its Stem, Branches, Leaves, &c. as appears by *Figure* 76. which, tho' but ſlenderly perform'd, exactly expreſſes the Shape and Bigneſs of it. The Skin is very thin, whitiſh, and tranſparent; and the Veins that compoſe the Stem, and greater Branches, are now rather black than dark Red, as I preſume they were at firſt; the Leaves are of a ſort of a dark and faded Green, variegated.

Microſcopical Obſervations on Green Weeds *in* Water, *and the* Animalcula *found with them, by Mr.* Leeuwenhoeck. *n.* 283. *p.* 1305.

V. I have often heard it ſaid, that that green Stuff or Weeds, which are obſerv'd to drive upon the Water, ſpring out of the Ground from under the Water; which Aſſertion I can by no means admit of: For as often as I have obſerv'd the ſaid green Weeds, I have always found that they are produced from the Seeds of the ſame kind, as all other Trees and Plants. I have always obſerv'd too, that this green Matter does not grow in deep Waters, tho' they are ſmall and ſtill; and that wide and ſhallow Waters abound therewith, and eſpecially Moats and Ditches; and that the Wind does it no harm. And I have likewiſe found that the green Weeds in thoſe Ditches, which have but little Water in them, are very ſmall in compariſon of thoſe which are in larger Waters; and near the Sides of the Banks where they are ſhallow, and very little Motion in them. *Delfs-haven* belongs to the Town of *Delft*, and lies about two Hours diſtant from it: From that Town by means of a Sluice, the Water of the River *Maes* with the Flood in Summer-time is brought into the Town; and it is as clear as if the River itſelf run through the Town. With this Water alſo comes in a little green Stuff, but ſo little that we were half an Hour fiſhing up thirty of thoſe Weeds, and putting them into an Earthen Pot, together with a large Quantity of their own Water; for we took them up as deep as we could, that we might not hurt the Roots. I took out ſeveral of theſe Weeds from the Pot, one by one, with a Needle very nicely, and put them into a Glaſs Tube of a Finger's Breadth, fill'd with Water; and alſo in a leſſer Tube, and cauſed the Roots of the Weeds to ſubſide leiſurely: And looking upon the ſame with my Microſcope, I was ſurpriz'd with the Sight of a great many and different kinds of *Animalcula*; of which, two ſorts had long Tails, whereby they ſeem'd faſt link'd to the Roots of thoſe green Weeds. Theſe *Animalcula* were in ſhape like a Bell, and they ſo ſtirr'd the round Cavity of their Bodies, that they put the ſmall Parts of the Water into ſuch a Motion, that I could not ſee thoſe Inſtruments they uſed to produce the ſaid Motion. I ſaw 20 of theſe *Animalcula* together gently moving their long

Tails and out-ſtretch'd Bodies; they contracted their Bodies and Tails in an Inſtant, and then ſoftly extended them again; and this kind of Motion they continued a great while, that it was very diverting to obſerve them. I cauſed one of theſe *Animalcula* to be drawn juſt as it appear'd faſten'd to the Roots of the aforeſaid green Stuff.

Fig. 77. *Fig.* 77. A, B, C, repreſents one of theſe green Weeds of a common Size, as it lay upon the Water, and appeared to the naked Eye of the Limner.

Fig. 78. *Fig.* 78. D, E, F, G, ſhows the very ſame Weed as it appear'd in the glaſs Tube filled with Water, with the Roots thereof extended.

Fig. 79. *Fig.* 79. H, I, K, L, M, N, O, P, Q, R, repreſents a ſmall Part of the ſaid Root, as it appear'd to the Painter in the Microſcope, in which Roots were to be ſeen the Veſſels, with their Diviſions, thro' the Length of the whole Root; and theſe Roots, I imagine, were of no longer Uſe, and in a manner wither'd: They were alſo overgrown with a great many particular long Particles, and moſtly with little Figures like Flowers, as they are here repreſented in the 79 *Fig.* between K and L.

The *Animalcula* which I mentioned above, and liken'd to little Bells, are to be ſeen in the ſame Figure in I, S, T, and N, V, W. And I ſaw above 100 of theſe *Animalcula* with their Tails faſten'd to the Root, and living between H, I, K, L, M; but other Roots had none of theſe.

In ſeveral of theſe Roots I obſerved one, and ſometimes, but ſeldom, two Sheaths or Caſes faſtned in them of ſeveral Sizes; the biggeſt is repreſented by R, X, Y. Out of the ſame Sheath appear'd a little Creature, the fore-part of whoſe Body was roundiſh, as in X, Z, Y; and preſently from the ſame Rotundity proceeded two little Wheels that had a ſwift Gyration, as in *Fig.* 79, A, B, C. Theſe ſmall Wheels were thick beſet with Teeth, like the Wheel of a Watch; and when theſe *Animalcula* had for ſome time exerted their circular Motion, they drew their Wheels into their Body, and their Body wholly into their Sheaths, and then ſoon after thruſt them out again with the aforeſaid Motion; another while they remain'd as it were ſhut up in their Shells: And tho' I obſerved the ſame Wheels in other *Animalcula* alſo, yet their Bodies differed from each other, and the Sheaths were of a darkiſh Colour, ſo that I could not eaſily perceive the *Animalcula*; and moreover, they ſeem'd to be compoſed of Globules.

I alſo obſerved other Sheaths that were ſeveral degrees ſmaller than thoſe before mentioned, and they were as tranſparent as Glaſs, ſo that one might plainly ſee the *Animalcula* lying within them.

Fig. 79. *Fig.* 79. P, D, E, F, repreſents the Sheath with the little Worm, P, D, F, in it. The ſame Figure O, G, H, ſhows a Sheath with half the Body of the ſame *Animalcula* G, H, protruded out of it; and in which, by reaſon of its exceeding Smallneſs, one could ſee the Wheels

but now and then, and that only when the ſaid Body was extended, which would ſoon be compreſt or ſhrunk up.

Moreover, I obſerved one of theſe *Animalcula*, whoſe Body was ſometimes long, and ſometimes contracted; and about the Middle of its Body, which I conceiv'd to be the lower Part of its Belly, there was another of the ſame kind, but ſmaller, the Tail of which ſeem'd to be faſtned to the other. I cauſed one of theſe *Animalcula* (for the ſake of its wonderful Figure and Generation) to be drawn by my Limner about twice as big as it appeared to the naked Eye, whilſt it was in the Water, and faſt link'd to the Root of the aforeſaid green Weeds.

Fig. 80. *Fig.* 80. A, B, C, D, E, F, G, ſhow you the *Animalculum* of which A is the Tail wherewith it faſtens itſelf; C, D, E, repreſents 8 Horns, whereas others that were ſmaller had but 6. 'Tis drawn as ſtretch'd out in its whole Length, whereas, when it contracted it ſelf, it was not the fourth Part ſo long. The Horns appeared of ſo wonderful a Make to our Eyes, that it almoſt puzzled the Limner to
Fig. 81. draw them; however, he drew a ſmall Part of one Horn, as in *Fig.* 81, K, L, M.

Fig. 80. In *Fig.* 80, you may ſee an *Animalculum*, B, H, coming out of the Body of the bigger, which *Phænomenon* when I firſt perceived, I thought it might be a young *Animalculum* faſtned by chance to an old one; but obſerving it more narrowly, I ſaw it was a *Partus*; for I could now ſee, that whereas this *Animalculum* (when I firſt diſcovered it to be) had but four very ſmall Horns, after the Space of ſixteen Hours was grown much bigger both in Horns and Body, and 4 Hours after that it forſook its Mother's Belly.

In the Diſcovery of the ſaid young *Animalculum*, I had obſerved on the other ſide of the Body of the biggeſt *Animalculum* a round little Knob of Seed, that from time to time, and in few Hours grew ſtill bigger, as in *Fig.* 80, between G and I, and at laſt grew to be pointed, and in 13 or 14 Hours was grown ſo large, that you might ſee two Horns upon it. In the Space of 24 Hours, the laſt mentioned *Animalculum* had acquired four Horns, one of which was ſmall, the ſecond bigger, and the two others very large, and theſe two laſt were more ſtrongly protruded and contracted than the others. Three Hours after the little *Animalculum* was got clear of his Mother. I endeavour'd to purſue my Diſcovery of the Generation of theſe Creatures, and in order thereto wiped off the green Weeds from the Body, that I might make my Obſervations the better; but the *Animalculum* was not only dead, but his Horns and part of the Body was quite waſted.

Another *Animalculum*, that had brought forth two young ones, had her Body laden with another ſort of little Creatures, whoſe Shape was flat beneath and round above, and which I have obſerved in moſt Waters; and this laſt ſort were above a thouſand times leſs than the others whom they crawl'd upon, and hinder'd to go; but a much bigger *Animalculum*, whoſe Body was almoſt round, tormented one of the aforeſaid Creatures, not only by running upon its Body, but by clinging ſo faſt to one of its Horns, that whatever Effort t'other made to be rid of it, ſhe could not ſhake it off her Body; and at laſt I found ſhe had loſt one of her Horns in the Scuffle.

That which ſeem'd very remarkable, and even wonderful to me, was, that the ſaid *Animalcula* would ſometimes extend their Horns to ſo great a length, that looking on them through the Microſcope, you would think they were ſeveral Fathoms long. I caus'd the Limner to view the manner of the Extenſion and Contraction of the Horns, who was amaz'd as well as I to ſee the ſame.

I made him deſign a ſmall Part of the Horn ſo extended, as well as he was able, as you may ſee in *Fig*. 82. N, O, P, wherein alſo are Fig. 82. to be obſerved the knotty Protuberances, as in *Fig*. 81. K, L, M. Fig. 81. Theſe Protuberances ſeem to be compoſed of ſeven round Globules placed together, *viz*. one in the middle, which was more prominent than the reſt, and the others like a Roſe round about it.

Now what a Number of Veſſels and Inſtruments are to be found in ſuch a ſmall Part of a Horn, as is repreſented in *Fig*. 82. and fill'd with Bows and Knots like a Rope that is twiſted; and perhaps every ſingle knotty Particle is provided with as many Inſtruments, wherewith to put it in motion.

I obſerved in this Water, or rather in the green Weeds, abundance of ſtrange *Animalcula*, ſome of which feed upon the ſame green Stuff; and to others it ſerves inſtead of ſkulking Holes to hide themſelves from the Fiſh, which would otherwiſe devour them.

To return to the Generation of the above-mentioned green Weeds: I have ſeveral times obſerved, that moſt of the Roots are thickeſt at the End, and provided with a great many Parts that look like Flowers to the Eye, with long Pipes in them, which I take to be a gummy excrementitious Matter, which, by overſpreading the whole Root, cauſes it to die or wither. Now whether this is occaſioned by want of Nouriſhment (the Weed being quite ſpent) or whether the ſame is brought by the Wind or Stream in deep Waters, remains to be conſider'd, as alſo how ſhallow thoſe Waters muſt be where this green Weed can beſt grow.

I have often diſſected ſome of theſe ſmall Weeds, which had never yet produced any others, and have taken young Weeds out of them, which were ſo very ſmall that they eſcaped my naked Eye.

Let us ſuppoſe that *Fig*. 77. A, B, C, which we call a green Weed, is compos'd of three entire Weeds, of which that Part markt A, we'll call the Mother Plant, from whence proceed ſeveral Roots: Firſt, the Plant B is immediately produced by the ſaid Mother-Plant, and join'd to it by a String, that, as it grows, conveys its Nouriſhment to it, till it be provided with Roots of its own; before the

Weed B is arrived to its full Growth, A has brought forth another mark'd C, and that has no Root. Now if we ſhould diſſect one of thoſe Weeds, even tho' they were never ſo ſmall, we ſhall find young unborn Weeds within them.

I open'd one of theſe immature Weeds in the preſence of my Limner, and took out ſuch an Embrio as is before deſcrib'd, and placing it before my Microſcope, I made him draw it immediately, before that the Moiſture of it ſhould exhale; for if that ſhould happen, the Veſſel through which it receives its Increaſe in Nouriſhment, could not eaſily be deſcribed.

Fig. 83. *Fig.* 83. repreſents a Weed which I had taken out of another of the Bigneſs of C, in *Fig.* 77. This Weed received its Nouriſhment by that Part mark'd S, T. Between S, T, inwards, you may obſerve five ſmall Particles, which I imagine to be alſo young Weeds; and that Part too that lies between S, T, outward, is a young Weed as well as the reſt, tho' one would hardly think ſo, as it is here repreſented: but that Change of its Figure happen'd by the Exhalation of the Moiſture; for when I put it into the Limner's hands, it had as round and as entire a Shape as this ſame *Fig.* 83, Q, R, S, T.

This is an Anſwer to thoſe who aſſert that theſe green Weeds ſpring from under the Earth, ſeeing they proceed from a ſeminal Matter as well as other Plants.

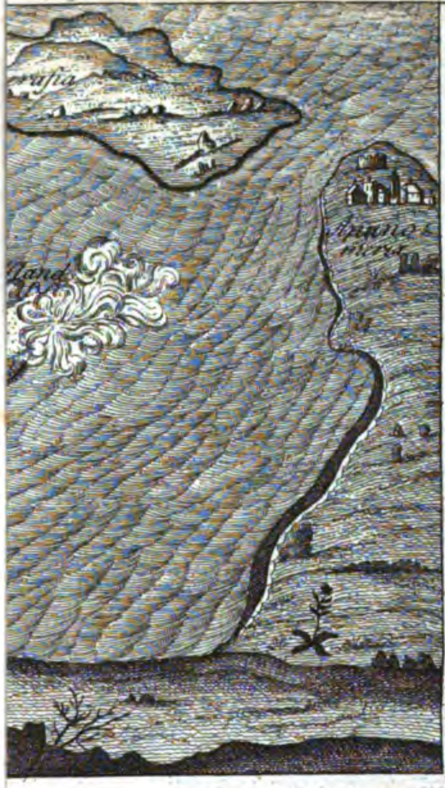
That I might yet more fully ſatisfy my ſelf, I caus'd ſome of theſe Weeds to be taken out of a Ditch belonging to a Linnen-Bleecher that was in diſuſe, becauſe no freſh Water could be brought into it. The Ditch was full of theſe Weeds; but the biggeſt of them were much ſmaller than the before-mention'd, but their Leaves much thicker.

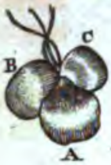
Having examin'd the Weeds, I found that, altho' they were arriv'd to their full Growth, they had but two Roots, which were longer than the Roots of the firſt Weed; and when I view'd the ſmaller Weeds, I could perceive they had a great many, but very ſhort Roots.

Whilſt I was obſerving the laſt Weed, I ſaw with wonder a great Number of *Animalcula* ſwimming in Circles through the Water; and ſo thick together, that even to the naked Eye they ſeem'd like a Cloud: I never ſaw any of theſe little Creatures in other Waters, and the next day they were all gone. There were a great many ſorts of theſe *Animalcula*, and each had their different Motion, and all ſo ſmall as to eſcape our naked Eye.

Among theſe I obſerv'd ſome were much bigger than the reſt, and were coupled together; in which Action they lay very ſtill on the Sides of the Glaſs; but a bigger ſort interrupted them. Whilſt they were quiet, I could eaſily ſee thoſe Parts which they uſe in Motion, and alſo the Motion of ſeveral Parts of their Body, which ſome would take for the Circulation of the Blood; but I rather eſteem it the

Plate X. Vol. V. Part II. pag. 224.





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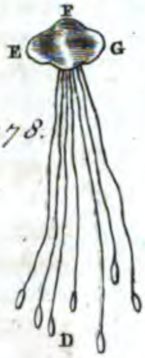
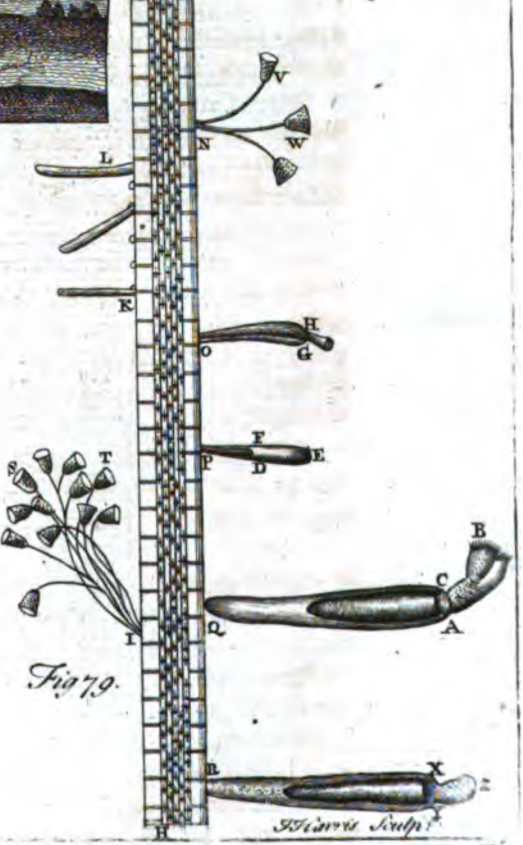


Fig 78.



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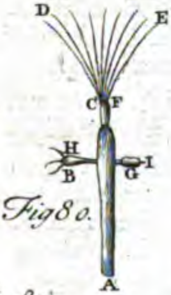


Fig 80.

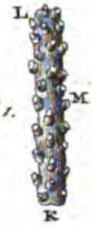
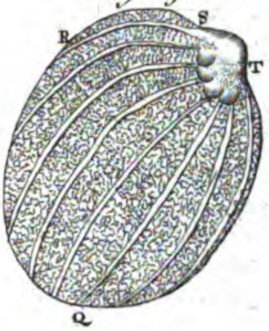


Fig 81.

Fig 83.



J. Harris Sculp.

the Chyle in the Guts. Theſe *Animalcula* were ſo big, that one might ſee them in clear Water, and in a Glaſs Tube; among ſeveral of theſe Sorts, I could perceive ſome as big as little Sands, and as compleatly form'd as our Garden Spiders.

—Remarks *on the foregoing Obſervations of Mr.* Leunwenhoek's, *communicated by Mr.* C. n. 288. p. 1494. Fig. 84.

2.] I have obſerv'd myſelf the ſame Mr. *Leuwenhoek* ſpeaks of; and his Picture being ſo ſmall, I thought my Sketches would not be unacceptable, becauſe they not only confirm his Account, but may contribute to give a more perfect Idea of ſo odd an Animal: I found it the beginning of this Month in ſome clear Water, which I took up in a Ditch at *W.* in which, with my utmoſt Attention, I could diſcover no more than this one of the ſame kind. *Fig.* 84. repreſents it in one of the Poſtures it appear'd the firſt Day (for it varies every Moment) and the Knob at *a*, which look'd like the Gut *Cæcum*, was ſometimes a little more lengthened: Two Days after I could perceive two or three white Fibres at the End of it; and on the fourth Day, the Animal lying ſtretch'd at its full Length, appear'd as in *Fig.* 85; and I plainly ſaw, that what I thought an Excreſcence was a young one, with ſix Horns, coming out of the Side of the old one; and the next Day I found it in the Water entirely ſeparated from the Body, and was about one third of the Length of the Parent. The Formation of the Horns are well figur'd by Mr. *L.* and they iſſue (like *Radii*) not from the Extremity, but quite round a ſmall Knob, which I take to be the Head. The Horns have a vermicular Motion, and are extended or ſhortened both all together and ſeverally. The other End is flat at the Extremity, and he often fix'd it (like a *Leech*) to the Bottom or Side of the Glaſs in which I kept him. He alſo contracts and dilates his Body at pleaſure, and eſpecially, when touch'd or diſturb'd, will bring both Body and Horns into a ſmall Compaſs, and has then the Appearance of *Fig.* 86, and 87. The Horns are perfectly white, and the Body yellowiſh, and to a naked Eye not eaſily diſcernible in the Water, it being, when extended, no thicker than a good Horſe-Hair.

Fig. 85.

Fig. 86, 87.

The ſmall Plant mention'd in the ſame Paper, is the *Lens Paluſtris* or *Duck-meat*, which floats plentifully on our Ponds or Ditches. But I muſt diſſent from Mr. *L.* where he ſays it does not come originally from the Bottom; for I very well remember that, many Years ſince, the late *W. Ch.* Eſq; ſhew'd me the manner of its ſpringing out of the Mud; and we often obſerved, that when the Leaves were grown to a competent Size, the Force of the Water eaſily drew the minute ſingle-fibred Root, and raiſed the Plant to the Surface. I own that the Leaves when floating do continue to grow, and may be increaſed after the manner he mentions, and I have often taken the young Plant which he pictures, out of them, ſo that they may be call'd Seeds more properly than Leaves; and my Opinion is, that towards the End of the Year, upon their Corruption, they ſink to the Bottom, and there take Root, ſo as to continue the Succeſſion.

The *Animalcula*, which Mr. *L.* deſcribes, ſticking to the Root of the Plant, I have often obſerved, not only in Water-Plants, but adhering to the Bodies of many ſorts of Water-Inſects, which I have ſeen cover'd almoſt all over with Tufts of them; each Tuft being made up of many *Animalcula*, which appear not much unlike to the Flowers of a Lilly or *Fox-Glove.* This Congeries of *Animalcula* will lengthen and contract themſelves both all together, and ſeverally; and I have obſerved them, when they lie at length, to put out ſome wonderfully minute Organs, like ſmall Feet (not eaſily diſcern'd even with my beſt Glaſſes) which by their quick Agitation bring a Current of Water from all ſides towards them. But I was never ſo fortunate as to ſee that Motion in them, which he ſays is like that of a Mill-Wheel; nor indeed can I perceive the Poſſibility of ſuch a Rotation of any Member in an Animal Mechaniſm. But I think I can eaſily account for this Miſtake of Mr. *L.* or rather of his Painter; for in the ſame Water wherein I have ſeen theſe Plants and *Animalcula*, I have obſerv'd a ſmall round Creature, whoſe many Legs ſtand like *Radii* all about its Body. This has a ſwift progreſſive Motion, but will very often lie ſtill (when only you can perceive thoſe *Radii)* and then turn very ſwiftly round like a Wheel, ſometimes one way, and then ſtop and turn the other way, without ſtirring an Hair's Breadth forward. Now 'tis very probable that one of theſe might ſhew its Tricks ſo very near to, or among a Tuft of the other fix'd *Animalcula*, that it might be very well taken for part of the ſame, and I am very confident this is Matter of Fact.

Theſe *Animalcula* are ſometimes ſeen looſe; but generally they are fix'd in Cluſters by their Tails to other Bodies, and perhaps cannot ſeparate themſelves; and I think it no mean Inſtance of Providence, that many kinds of Water-Inſects which are ſo fix'd, and even ſome of which have but ſlow and irregular Motions, are furniſh'd with ſuch Organs about their Head, the Vibration of which brings a conſtant Current towards their Mouths, and, with that, Food for their Support; otherwiſe they would be ſtarved for want of Nouriſhment.

The Inſects on whoſe Bodies I have ſeen theſe *Animalcula*, are of divers ſorts; and I have obſerved no ſmall Variety in the Water of our Ditches, not only of *Reptiles*, and the *Caterpillar* kind, but of *Eels* and perfect *Shell-Fiſh*, both *Cruſtaceous* and *Teſtaceous*, and have been ſo pleas'd with the Beauty of ſome of them, that I have kept them many Weeks by me, as an agreeable Entertainment for ſuch as are curious; and farther deſign'd, if I could have met with a good Hand in the Country, to have got ſome Figures of them, which I had attempted myſelf, but with no Satisfaction. However, I have preſerv'd two tolerable Sketches of two ſorts of the *Cruſtaceous* kind. Fig. 88, 89. *Fig.* 88, and 89, ſhew them as they lie with their Back towards you in a ſwimming Poſture; but the Members and Legs on the other Side are ſo various, and ſo much more curiouſly form'd than thoſe of Lobſters and Shrimps, that I deſpair'd of giving any tolerable Repreſentation of them in any other Poſition. Theſe are about the ſame Size, the biggeſt being rather leſs than a very ſmall Flea, and the leaſt a little bigger than a Mite; but all are Breeders, and carry their Spawn at their Tail, that of *Fig.* 90. in two Bags (one on each Fig. 90. Side) which are faſten'd about the fifth Joint, and the other in a ſingle Bag or Film under the Tail; and I have often ſeen theſe Bags broken, and the Spawn (which is globular and large in the Proportion to the Fiſh) ſcatter'd through the Water. There is alſo among theſe a third ſort of the ſame kind not leſs elegant, tho' far leſs in Bulk, which is ſhap'd more like a Shrimp, and carries its Spawn like that; but I could never make any Figure of it worth preſerving. All theſe three Species (as alſo ſome other Water-Inſects) are certainly monoculous, and have their Eye exactly in the middle of their Head, and I could never, with my utmoſt Application, find ſo much as a dividing Line in it. Some of them, eſpecially in ſome Waters, are dark and cloudy; but they are generally ſo tranſparent, that through the Shell I can ſee the *Periſtaltick Motion* quite through their whole Length, and a conſtant Pulſation of a Part, which I gueſs is the *Heart*; but I could never diſcover any Courſe of Blood in them (nor even in *Shrimps*, which are as large as ſome Thouſands of theſe) tho' I have ſeen it plainly in Creatures a little bigger, *viz.* the ſmalleſt new-hatch'd *Spiders*, and in that Water-Inſect which is deſcrib'd and pictur'd (tho' not accurately) by *Swammerdam*, under the (very improper) Name of *Pulex aquaticus.* But this is of the Teſtaceous kind, of which I have ſeen a greater Variety (and not leſs curious) than of the Cruſtaceous.

3.] I have farther obſerv'd the *Lens Paluſtris*, and am fully ſatiſ- *—farther Obſervations.* fy'd of the Truth of its firſt ſpringing from the Bottom. I lately *ibid.* p. 1498. took up ſome on the ſhallow Side of a Pond, and found the Ends of the Stalks (moſt of which were at leaſt five Inches long, and as thick as a ſtrong Horſe-hair) manifeſtly radicated in the Bottom, ſo that I could not take them up without raiſing the Mud with them, which alſo adhered very viſibly to them. Theſe Stalks or Roots are of a curious Texture, and almoſt tranſparent; and I have ſeen their Outſide very prettily cover'd with a regular ſort of Net-work. The Draught Mr. *Leuwenhoek* gives is very ſtiff, and ill repreſents them. *Vide* ſupra.

In my Obſervation of theſe Stalks, I often ſaw adhering to them (and ſometimes ſeparate in the Water) many pretty Branches, compos'd of rectangular Oblongs and exact Squares, which were join'd together, as in *Fig.* 91. which I drew as exactly as I could from one Fig. 91. of them. There are often twenty or more of theſe Figures in one Branch, which generally adheres at one End, to the Stalks of the

Plant; and I think it remarkable that theſe Rectangular Parellelograms are all of the ſame Size; the longeſt Side exceeds not $\frac{1}{8}$ of an Hair's Breadth, and that the Length is juſt double the Breadth, the Squares being viſibly made up of two Parallelograms join'd longwiſe. They ſeem very thin, and the Texture of every one is nearly the ſame. To a very large Magnifier they appear as in *Fig.* 92. I took theſe Branches at firſt for Salts; but finding them always of the ſame Size, and that there was no ſenſible Increaſe of their Bulk while they continued in the Water; that after they had lain a Day or two dry on a Glaſs Plate, they alter'd not their Figure, and upon the Addition of new Water (warm or cold) they had ſtill the ſame Appearance and Coheſion; and that their Adherence (tho' touching only in the angular Points) was ſo firm and rigid, that all moved together, and kept the ſame Poſition in reſpect of one another, however agitated by the Water: Theſe Conſiderations, I ſay, perſuade me, that they may be rather Plants than Salts; but they being ſo very minute, that no Judgment can be made of 'em but by the Eye, I ſhall not determine any thing poſitively.

Fig. 92.

A Water-Newte.

In ſome Water which I took out of a Pit, I found a ſmall *Water-Newte*, not an Inch long, which I ſuppoſe was of this Year's Hatch; and the Legs being ſo ſmall as not readily to be diſcern'd at firſt View, and the Body very clear, I took it at firſt Sight for a Fiſh. This I kept by me (inſtead of Tadpoles) to ſhew the Circulation of the Blood in its Tail. But that was not the only Entertainment it gave me; for I found the Courſe of the Blood in every Part of its Body, and particularly in every Digit of the Feet: It was a curious Sight to obſerve the Stream come to the Extremity of the Toe in one Channel, and return by another. In this *Newte*, juſt below the ſetting on of the Head, on each Side, are three little rugged fleſhy Branches, which he ſpreads like Fins, and which help to poiſe his Body. Obſerving theſe with the Microſcope, I found each of them divided (ſomething like a Leaf of *Polypody*) into a great many pointed Branchings, in each of which (as in Toes) I can ſee the Blood come to the extream Point on one Side, and return on the other; and this is the more entertaining, becauſe 30 or 40 of theſe Branchings will ſometimes appear at one View, and the Blood ſeen diſtinctly circulating in all. For, as Mr. *Cowper* rightly obſerves, the Globules of the Blood of theſe Creatures are very large, ſo that I can ſee the Circulation in them very well, even with the ſmalleſt Magnifiers, which take in a great *Area*. And from what has been ſaid of this Courſe of Blood, I am perſuaded, that theſe Organs in the *Newte* are not only deſign'd to be ſerviceable in their Swimming, but (though they have *Lungs* like a *Frog*) may be alſo Analogous to the *Gills* in *Fiſhes*.

In my Examination of the Waters of our Ditches (in which I daily find new Varieties of *Animalcula*) I had the good luck to meet with great Numbers of thoſe round Bodies mention'd by Mr. *Leuwen-*

hoek in the *Tranſactions*, N° 261. which are there ſo well deſcribed, that I ſhould not have again ſpoke of them, only that I ſaw a very ſurprizing Phænomenon while I was obſerving them. Each of thoſe Spherical Bodies (which are ſmaller than a Muſtard-Seed) have a conſtant progreſſive Motion, and at the ſame time a ſlow Revolution about their own Axis, and contain within them other ſmall Globules, ſome more, ſome leſs; but I never found above ten in any one; and theſe I have ſeen move and change their Poſition within the other, which Mr. *L.* ſays he never obſerved. While I had one of theſe Bodies on a Glaſs Plate before my Microſcope, I ſaw (as he deſcribes it) one of the contain'd Globules ſlip out of it; and while the great one lay ſtill, for want of ſufficient depth of Water to float in, this little one that came out had immediately a very quick Rotation on its Axis; and what was moſt ſurprizing, at the ſame time it kept an equable Revolution about the bigger Globe, as the Center of its Orbit, always very nearly at the ſame diſtance, tho' I could not perceive any Vortex in the Water which bore it: and what is yet more remarkable, I ſaw it ſtop, and then make its Revolution round the Central Body the contrary way, the Rotation on its own Axis always continuing. And when the Water was ſo far evaporated that all lay at reſt, by the Addition of new Water the ſame Motions were renew'd. This I thought a very pretty Repreſentation of the Planetary Motions about the Sun, and I doubt not but a *Carteſian* would have been not a little pleas'd, to ſee in Nature ſuch an Inſtance of ſuch Revolutions of an inanimate Body in ſuch a Medium as Water. Indeed I think it not eaſy to account for theſe Motions of theſe Globules; nor will I, to ſolve the Difficulty, ſay in contradiction to Mr. *Leuwenhoek* that I believe them animate, tho' I have formerly ſeen ſome not very unlike them both in Shape and Motion, which I am ſatisfy'd are Animals.

—*Of* Earwigs.

I find all the *Earwigs*, which I have examin'd by a Microſcope, infeſted with great Numbers of minute Inſects, which ſtick like Lice on many Parts of their Bodies, and eſpecially juſt under the ſetting on of their Heads. They are alike on all, and I never found the ſame on any other Animal; they are white and ſhining like Mites, but much ſmaller, are round back'd, flat bellied, and have long Legs, eſpecially the two foremoſt.

Microſcopical *Remarks and Obſervations, by—communicated by Sir* C. H. n. 284. p. 1357.

4.] I have made proof of my new Set of Microſcopes made by Mr. *Wilſon*, † and have found the way of applying them very readily. The Contrivance of the Ivory Box and hollow Screw for Approach, with the illuminating Convex at the End of it, is of great ſervice both by Day and Candle-light, and the Sliders with the plain and concave Glaſs Plates for Objects very convenient. But the Braſs Tool I think capable of Improvement: I purpoſe to have one made with ſome new Accommodations, *viz.* a fine threaded Steel

† *Vid.* ſupra, V. iv. p. 199.

Screw for a more ſteady Approach, and ſome new Turns and Motions to the Arm which carries the Object, *&c.* And I propoſe alſo to have a Braſs Arm to ſlide up and down on the ſquare Rod of my deep Microſcope, to which I would with a Screw fix either the Ivory Box, or the Handle of the Braſs Tool, to be ſet by that means in a ſettled Poſture to any Height or Inclination required, which will be very neceſſary when an illuminating Glaſs is applied to either.

As for the Glaſſes themſelves, I think them very good and well wrought, and (tho' not ſo neatly ſet) to go far beyond any I have ſeen of *Mellins.* The greateſt Magnifiers eſpecially augment more, and yet ſhew an Object more diſtinct than his. My greateſt ſhew an Hair of my Head to any Eye conſiderably above an Inch diameter, and ſome Eyes judge it at leaſt two Inches; but ſuppoſing it a bare Inch, and that (as Mr. *Hooke* affirms) 640 Hairs breadth make one Inch, the Length and Breadth of an Object will by it be augmented 640 times, the Surface 409600, and the Solidity 262144000.

But the beſt of ours muſt needs fall ſhort in Power and Goodneſs of Mr. *Leuenboek*'s Glaſſes, whoſe Skill both in making and uſing them I fear we ſhall not eaſily reach. I know many queſtion the Sincerity of his Relations; but I can do him that Right to affirm, that as far as I am able to follow him (and I have tried many of his Experiments) I find him always faithful in Matter of Fact, and therefore queſtion not his Veracity in other things. 'Tis not fair to ſay I have looked on ſuch Objects, and found no ſuch thing as he mentions. There is more than an haſty curſory View required in Obſervations of this kind; there muſt be Patience and Attendance, and ſome Skill in managing the Glaſſes, Objects, and Light to the beſt advantage: Beſides, there are many lucky Hints and Coincidences, and all this to little purpoſe, without a ſtrong and good natural Sight, and an Eye uſed to Glaſſes; for I ſcruple not to ſay, that a diſcerning and critical Eye, as well as a nice and good Ear, is gained and improved by Experience.

——On a Louſe.

In a living *Louſe* I could plainly ſee the Motion of the Muſcles, (when he ſtirr'd his Legs) all which are joined in a longiſh dark Spot in the Middle of his Breaſt, where the Tendons ſeem all united. The like Motion of Muſcles is alſo viſible in the Head when he ſtirs his Horns, and in the ſeveral Articulations of his Legs. I ſaw alſo clearly a Multitude of various Branchings of Arteries and Veins, and the Pulſe regularly beating in ſeveral Arteries. But the moſt entertaining Sight is the *Periſtaltick Motion* of the Inteſtines, which is continued from the Stomach through all the Guts to the *Anus.* I have obſerved the like *Periſtaltick Motion* in a *Flea*, and in ſeveral ſorts of ſmall tranſparent *Maggots* and *Caterpillars.* But a *Louſe* will bear rougher handling, and live confined between two concave Plates, if not cruſhed, four or five Days.

I thought a *Mite* would alſo prove a good Subject for the like —*On* Mites. purpoſe, but found them not ſo ſo tranſparent as I expected. However, I plainly ſaw that all the Briſtles on the Body of one of them (which to a common ſingle Glaſs, and to the greateſt Magnifier of my three-glaſſed Microſcope look like plain ſmooth Hairs) were, when viewed with a large Augmenter, all ſpicated, or bearded like the Ear on the Seed-head of ſome Graſſes. The Appearance was like *Fig.* 93. which Fig. 93. ſhews part of the Briſtle; but I cannot expreſs the Beauty and Regularity of it; and every Briſtle on the whole Body and Legs, both long and ſhort, had the ſame Formation. But all Mites are not ſo; for of ſeven or eight incloſed together, I found but one whoſe Briſtles were of this Make; in the reſt the Horns only were ſpicated. Whether they were of different kinds, or rather only of different Sexes, I ſhall not determine; they were all taken out of the ſame Cheeſe at the ſame time, and were in other Parts very like. Their Mouths open horizontally (to the right and left) like that of a Waſp, and hard-headed Maggot; and after their being ſome Days ſhut up together I found ſome dead, and the Survivors preying on them; which gave me an Opportunity of obſerving their manner of feeding, which was very remarkable; for they thruſt one Mandible forward, and bring the other backward at the ſame time, and this alternately, and by that means ſeem to grind their Food.

If you would bring one of the greateſt Magnifiers to obſerve a Mite, or the like minute Animal, you muſt lay him on a thin *Muſcovy* Plate in one of the Sliders, and cover him with a Concave, and take good care not to cruſh the Object between the Plates in your Approach.

I pull'd off an Handful of *Muſcles*, which ſtuck on a piece of a —*On* Muſcles, *&c.* Rock that was covered by the Sea every Tide. Theſe I brought with me, that I might obſerve the Organs by which they fix themſelves ſo firmly to a Stone, that even a Storm will not waſh them off. I found that theſe were Threads which came from that part which is called the Beard of the Muſcle, which had on their Extremity a flat ſpungy Subſtance, that adhered only by Impoſition, like the wet Pieces of Leather which Boys faſten to Stones, and they are deſcrib'd, and well pictured by Mr. *Leuwenhoek.* But my principal end in gathering theſe Muſcles was, that I might view and examine the Inhabitants of thoſe little white Shells, which ſtick like Puſtules on Muſcle-ſhells (as they do likewiſe upon Lobſters, Oyſters, Stones, *&c.*) Theſe are alſo mentioned by Mr. *L.* who gives a Picture of one of theſe little Creatures taken out of its Shell. His Draught is very accurate, only that in the twelve long Branches growing from the Head, the Briſtles are there pictured coming out quite round on each Joint of every Branch; whereas they only grow on the inſide, (all the hind Part being perfectly bare) and look not unlike a ruffled

Feather ſtript on one ſide. I cannot gueſs at the Uſe of theſe curious Ramifications, unleſs they ſerve to draw in Food to the Creature, which cannot move out of its Place. For, keeping them alive in Sea-Water, I ſaw them often put them out through the Slit of the *Operculum*, which cloſes the Top of the Shell, and draw them in again. This, as I remember, the Naturaliſts call a *Balanus*, and claſs it with the *Concha Anatifera*. I never ſaw the latter; but that being much larger, if (as 'tis probable) it has the like Organs, we may eaſily account for the Miſtake of even ſome obſerving Men, who affirm they have ſeen them feathered, and think them Birds *in fieri*. Some of the Muſcles which I brought, were little above a Quarter of an Inch long. I took one of theſe out of the Shell, and expoſed it to the Microſcope on a thin Plate of *Muſcovy* Glaſs; and holding it to the Light of a Candle, I ſaw in the thinner Parts a vaſt number of Veins and Arteries, and the Blood circulating in them more diſtinctly than ever I ſaw it in any other Animal. For I had this Advantage in the Obſervation, that the Object lay always quiet, without changing Place; and my Plate was ſo thin, that I could bring to it what Magnifiers I pleaſed, and look without diſturbance as long as I pleaſed: For whereas other Animals will not eaſily be brought to lie ſtill any conſiderable time, and will not live long when expoſed to a Microſcope; this lay always in the Poſture it was placed, and the Motion of the Blood continued with little Alteration ſix or ſeven Hours, only by keeping the Object moiſtened with Sea-Water, and might have laſted much longer if I had not thrown it away. I repeated the ſame Experiment for two or three Days with ſome of the remaining Muſcles, with little difference in the Succeſs.

A ſmall **Worm.** The other day I ſpied running among ſome Fruit a ſmall Worm, which I could perceive to have a Multitude of Legs; it was not half an Inch long, and the Body not thicker than an Hog's Briſtle. This I put alive into a ſmall Tube, and found it a perfect *Scolopendra*, whoſe Body was made up of ſixty Inciſures, at every one of which was a pair of Legs (one on each ſide) and each Leg had five Articulations. On his Head were two Horns, each of ſixteen Joints, and under it a Pair of terrible Forcipes, red, crooked, and pointed like the Talons of an Hawk, and I often ſaw him open and ſhut them, and wipe his Horns thro' them. Theſe Forcipes are not unlike, and probably for the ſame Uſe as thoſe on the Head of a Spider; but they are difficultly ſeen (becauſe generally kept cloſe) in a living Spider; but you may readily find them open'd, and in their perfect Shape, in the Spider's *Exuviæ*, or caſt Coats.

A Tick. I found a ſmall black flat *Tick*, (after walking in a Thicket) ſticking on my Arm, and it had got its Forepart ſo far into the Skin, that I had much ado to ſeparate it with the Point of a Needle, ſo as to preſerve it entire and unhurt. I obſerved the Snout of this to be ſhaped not very unlike the jagged *Proboſcis* of the *Serra Piſcis.*

The forepart of it *a*, being like the End of a broad-pointed Sword, is clear and tranſparent, and has three Teeth on each Edge; below which there comes out another ſerrated Part *bb*, on each ſide, almoſt at right Angles; but this is partly hid (when you look on the Back) by a thin Horn *c* on the ſide of the Head. I broke off one of the Horns at *d*, and then it appear'd as in the Figure. I afterwards examin'd the Snouts or Proboſcis of *Dog-Ticks*, to ſee if they had the like Conformation, and found their Appearance as in *Fig.* 95. the Snout *a* being ſo covered by the two clumſy thick Horns *bb*, that the ſerrated Edges could not be perceiv'd; but ſeparating the Horns (with ſome Difficulty,) they appear'd in the Poſture of *Fig.* 96. and I could then plainly ſee eight Teeth or Jags on each Side, as here expreſs'd; but the Snout of a *Dog-Tick* has not the additional ſerrated Part, which is in the *Wood-Tick*. I could alſo perceive a Pipe or Channel run through the Snout, and ſee ſome Bubbles move up and down in it, which I have endeavour'd to repreſent.

Fig. 95.

Fig. 96.

Animalcula *in* Pepper-Water.

I have found ſome of the *Animalcula* in *Pepper-Water*, almoſt incredibly minute, which appear even to my greateſt Magnifiers not ſo large as a Mite to a naked Eye; and in the bigger ſort I can plainly ſee the little Feet, by which they perform ſuch briſk Motions, which I never could find before. But I doubt not but your own Microſcopes have ſhew'd you what is diſcoverable in theſe Liquors, and therefore I ſhall ſay no more of them. Only I cannot omit mentioning one ſort of Animal in them, which I never diſcover'd till within theſe three or four Days: Theſe are very ſlender long *Worms*, of which my Pepper-Water is prodigiouſly full: They are all of the ſame Thickneſs; but their Lengths are very different, ſome being twice and ſome thrice as long as others; and at a Medium I judge the Proportion of their Length to their Breadth at leaſt as fifty to one. Even to the largeſt Magnifiers they look like Shreds of Horſe-hair (to a naked Eye) from a Quarter to three Quarters of an Inch long. Upon a modeſt Eſtimate, their Thickneſs is not the hundredth part of an Hair's Breadth; and conſequently, if you imagine an Hair of your Head ſplit into above 7800 equal Fibres, each Fibre would be as thick as one of theſe Creatures. Their Motion is equable and ſlow, and generally they wave their Bodies but little in their Progreſſion, tho' ſometimes they make greater Undulations. But what is more remarakable, they ſwim with the ſame Facility both backward and forward, ſo that I cannot diſtinguiſh at which end the Head is; and I have ſeen the ſame Worm go forward with one end, and back again with the other end foremoſt above twenty times together. And ſometimes they will (like Leeches) fix one end on the glaſs Plate (on which I lay the Water) and move the looſe Part of their Body round about very oddly. Theſe I take leave to call *Capillary Eels*, and I have given, as well as I could, a Repreſentation of their Ap-

Fig. 97.

pearance to a great Magnifier, in the ſeveral Poſtures I have ſeen them ſwim.

The Duſt *of the* Puff-Ball.

I find the Duſt of the *Fungus Pulverulentus*, or *Puff-Ball*, to be the minuteſt Powder that I ever ſaw: To a naked Eye (when 'tis cruſhed) it appears like a Smoak or Vapour, and with a common Microſcope you cannot diſtinguiſh the Particles. But when 'tis view'd with the greateſt Magnifiers, each Grain is viſible, and exactly alike, and appears a perfect Spherule of an Orange Colour, ſomething tranſparent; whoſe Axis is not above the fiftieth Part of the Diameter of an Hair. So that a Cubical Veſſel of an Hair's Breadth of a Side would hold 125000 of them. This was the Duſt of that *Fungus* which is bigger than your two Hands put together: And I obſerv'd ſince in another Puff-Ball of the ſize of a ſmall Crab (which I take to be a different kind) that all the Globules were darker, and that every one had a little Tail or Stalk affixed to it. I at firſt imagined that theſe (tho' ſo minute) might be Seeds; but I found that the Smut of Corn was compoſed of the like regular Globules, and about the ſame Size. My way of obſerving theſe, and the like Duſts, is to breathe gently on a thin *Muſcovy* Plate, and then covering lightly with the Powder, to blow it off again; for enough will adhere, and they ſhould not lie in Confuſion.

I have met with great variety of very beautiful minute Flies and Inſects on Leaves and Flowers; eſpecially one very pretty *Grub*, which I found plentifully adhering to *Nettle-Leaves*, which is a wonderful thin Creature, has a ſort of a Covering all over his Back like a broad Shield, which he lies under like a Tortoiſe, and is all over beſet and fringed round with Spikes.

Animalcula *in the* Semen *of a* Buck.

A *Buck*, which by Miſchance had his Leg broke, was kill'd: It being rutting time, I thought I might with the greateſt Advantage obſerve the *Semen Maſculum*. As ſoon as he was kill'd, I took out one of the *Teſticles*, with the adjoining *Seminal Veſſels*, and found the *Vaſa deferentia* very turgid, and full of a milky Fluid. After various Methods of viewing this Liquor, I ſaw the *Animalcula* (in prodigious Numbers) very perfectly in ſeveral Poſtures moving very briſkly, and ſhew'd them to others, who own'd they appear'd as plain as Tadpoles to a naked Eye. The greateſt Taſk was to lay them thin enough before the Microſcope; for when the Matter is too thick, you ſee nothing diſtinctly, but only a confus'd Motion; and when thin ſpread, it dries immediately, ſo that you muſt be very quick with it, or you will loſe your Labour. I diluted ſome of the *Semen* with warm Water, (juſt ſo much as would a little change the Colour of the Water) and by that means could ſee them more diſtinct and ſeparate, even with ſmaller Magnifiers; and they then kept their Shapes long, even till next Day, when put in a ſmall Tube, but were without Motion. To my beſt Glaſſes they appear'd about the Size, and in the Poſtures repreſented in *Fig.* 98.

Fig. 98.

In

Animalcula in Waters.

In my Obſervations of the *Animalcula* in *Waters*, I have many of the ſame Species in the ſeveral Infuſions, and even in Waters that have been expos'd any time without any particular Mixture, ſuch as you find in the Hollow of a Cabbage-leaf, or on the *Dipſacus*, &c, and I am confident that many of theſe are the ſame Creatures under different Dreſſes. For I have noted ſuch a regular Proceſs in them, and ſuch a conſtant Order of their Appearance, that I am of opinion moſt of them are the Product of the Spawn of ſome inviſible *Volatile Parents*, and generated like Gnats, and many other Sorts of Flies, which are bred, and undergo many Changes in the Water, before they take Wing. But I give this only as a Conjecture. Some of them alſo may probably be originally *Water Inſects*, or *Fiſh*, *ſui generis*, and are ſmall enough to be raiſed in Subſtance or in Spawn with the Vapours, and again to fall with the Rain, and may grow and breed again in the Water when kept; and this will ſeem leſs ſtrange, when I affirm that I have ſeen Fiſhes, ſome as ſmall as Cheeſe-Mites, of different Sorts, very wonderfully made, which are of the cruſtaceous kind, ſhell'd with many Joints, with very long Horns, fringed Tails, and have many Legs like Shrimps, curiouſly made; and that ſome of theſe carry their Eggs or Spawn under their Tails in one Bag, another ſort in two diſtinct Bags, and ſome kinds on the Fringes of their Legs like Lobſters. But as to the *Animalcula* in *Pepper-Water*, thoſe in *Fig.* 99. are very common, and deſcribed by Mr. *Leuwenhoek* in ſome of the firſt Tranſactions. Fig. 99. I have ſeen the Tails of ſome of theſe nine or ten times as long as their Body, (which is about ⅓ of an Hair's Breadth Diameter) but generally they are four or five times as long. As they move, they will often twitch up the Tail in the Poſture as at *b*, and this Spring is ſo ſtrong, as when the Tail is intangled (as generally it is) by the End, they bring back their whole Body by the Jerk, and Convolution of the Tail, which ſoon returns to its firſt Straightneſs. To a good Glaſs the End of the Tail ſeems to have a Knob on it as in *a*, and the Folding appears as in *b*; but examining it with one of the greateſt Magnifiers, I found the Knob to be only a cloſe ſpiral Revolution like the Worm of a Bottle-Screw, and that the whole Tail when twitched up was alſo a Spiral. I have endeavour'd to repreſent this Appearance (to the great Magnifier) in *c* and *d*. I have alſo ſeen them ſometimes as in *e*. I have farther obſerv'd, that when theſe lie ſtill, they thruſt out a fringed or bearded Mouth, which they can draw in again; and that a rapid Stream runs conſtantly toward their fore Part, as if they drew in Water: But I rather believe this Current is made by a nimble tremulous Motion of ſome minute Fins or Legs, which my Glaſſes will not diſcover.

Thoſe *Animalcula* mark'd *Fig.* 100. are alſo plentiful in all the Waters, and are the largeſt of all; and I can ſee them in a good Light and Poſition (without any other Aſſiſtance) with my bare Fig. 100.

Eye, their Length being about the Breadth of an Hair. Theſe have a very quick Motion, and are perpetually beating about like a Spaniel in a Field, and by their frequent Turns and Returns, ſudden Stops, and caſting off, ſeem to be always hunting for Prey. Their Bodies are very thin, that which I take to be the Back being much darker than the other Side; and you ſhall ſee them frequently turn ſometimes one Side, and ſometimes the other, towards your Eye, and many times you may ſee part of each. Their Edges are as it were fringed with a multitude of very minute Feet, which are moſt conſpicuous about the Head and hinder Parts, where are alſo ſome Briſtles longer than the Feet, which ſhew like a Tail; *a* ſhews one of theſe with the Back, and *b* one with the Belly toward you: And in *c* and *d* I have endeavour'd to repreſent it, as it often appears, in other Poſtures. I put ſome ſhort Shreds of my Hair into their Water to compare their Magnitudes by, and ſaw that they could uſe their Feet in running as well as ſwimming, for they would often ſtand on an Hair, and go on it forward and backward from End to End, often ſtooping down, and bending themſelves in ſeveral Poſtures.

Among theſe are generally another ſort (but not above $\frac{1}{7}$ of their Size) whoſe Feet are alſo very viſible; ſome of them are ſhaped almoſt like a Flounder, and others are rounder behind; for by their Motions and Actions I judge them the ſame Creatures. Theſe alſo will ſtand and run on an Hair, or any Filth in the Water, they are marked *ab*, *Fig.* 101. Fig. 101.

I have likewiſe ſeen them double as at *c*, and go forward ſo, like Flies in Copulation. I was ſurprized at the firſt View of this, thinking it a ſingle Animal of that Shape; but have ſince often obſerv'd them both join and ſeparate, and two of them following a third, ſometimes the firſt, and ſometimes the ſecond laying hold of it, and driving off the other.

The little Feet of theſe *Animalcules* are moſt diſtinguiſhable when the Water is juſt drying off, for they being then ſtranded, cannot change their Place; and if you watch that nick of time, you may ſee them move their Feet very nimbly, and diſtinguiſh them ſome little time after the Water is evaporated.

I thought thoſe which I call'd *Capillary Eels* had been peculiar to *Pepper-Water*, but have ſince obſerv'd the ſame (tho' but few) in ſome ſtanding Water which drain'd from an Horſe Dunghil. This Liquor was Mum-colour'd, and the moſt pregnant of all that I had ever ſeen; and it would look incredible if I ſhould tell you what a prodigious Number of all ſorts I eſtimated to be in a Quantity of it of the Magnitude of a Pepper-Corn, for they appeared as thick as Bees in a Swarm, or Ants on an Hillock, ſo that I was obliged to dilute the Water to obſerve the particular Sorts. I found in this not only almoſt all the *Animalcula* I had ſeen in the other Infuſions, but many Sorts which I never met with before. Among them were

in great plenty thoſe which are repreſented in *Fig.* 102; their extreme Fig. 102.
Parts look bright, and the Middle dark, and ſeem beſet with Briſtles, and their Tail is pointed with a long Sprig at its End; their Motion is ſlow and waddling.

But the prettieſt Object was a great Number of a kind of Eels, which appear moſt diſtinctly when the Water is almoſt dry, which make briſk Shoots, and have a pretty wriggling Motion; they are of different Lengths, and are about the Thickneſs of what I call Capillary Eels. I have drawn ſome of them in *Fig.* 103. with ſome of Fig. 103.
the Capillary Eels among them, that you may better judge of their Proportions.

I preſerved ſome of this *Dungbil-water* by me ſeven or eight Days, and found the Number of theſe little Eels decreaſing every day, till I could hardly find one in it, tho' they were as plentiful as before in the Water newly taken up. And on the contrary I obſerved great Numbers in the kept Water, which are very ſcarce in the freſh: Among theſe is one ſort very ſingular in its Shape and Motions; its Body is ſpherical, only a little pointed like a Pear, and it ſeems very Fig. 104.
pliable like a Bladder fill'd with Water, in which are a vaſt Number of dark Particles in confuſed Agitation. Their moſt remarkable Motion is a revolving one; they will turn ſometimes above an hundred times, ſometimes not half ſo faſt, in a Minute the ſame way, and then ſtop, and turn the contrary way; and all this without moving a Hair's Breadth out of their Place. They will alſo go forward, turn and return, and fetch a large Compaſs with many Deviations, and in their Progreſſion they always (even in the ſhorteſt Turns) keep their pointed End foremoſt, the revolving Motion ſtill continuing. And when the Water dries, their Skin breaks, and the incloſed Liquid diffuſes. I have given their Shapes in *Fig.* 104. Theſe are of different Magnitudes.

There is another ſort, repreſented in *Fig.* 105. in great numbers, Fig. 105.
which are near as long as the biggeſt kind formerly mentioned. Theſe have briſk Motions, and are very active, and have many Feet before, very viſible. They will often contract, and again lengthen themſelves as they ſwim; but eſpecially when the Water dries, they will ſhrink themſelves up into a globular Figure, and the Feet then ſtand out, which you may ſee move very nimbly a conſiderable time after. Theſe alſo are of different Sizes; ***a a*** ſhews them at their Length, and ***b b*** repreſents them contracted.

I have alſo given the Figure of another oddly made Animal not Fig. 106.
uncommon among the reſt, which is as large as the former, and in its Motion (which is very nimble) keeps always the ſharp end foremoſt. I have obſerved ſome Variety in theſe (tho' I take them to be of the ſame Species) ſome of them being clear, and curiouſly ſtriated from the point to the thick end, others only having the Fore-part

clear, and the Bottle dark, as is ſhew'd at *a* and *b*; but I cannot by any Glaſs find the Organs by which they move.

I have found a curious Mechaniſm in a ſmall *Diving Inſect* which inhabits ſtanding Water. 'Tis like a ſmall *Fly*, with an Head like an Houſe Cricket; but in the Place of Wings it has two Paddles on the Shoulders, and on the End of the hinder Legs, (which are longer than the other four) inſtead of Feet and Claws, are perfect Oars. I have alſo taken notice in two or three ſorts of Flies, that behind the Eyes, on the Top of the Head, are placed three Protuberances (in Equilateral Triangles, with the Point foremoſt) with a black ſhining Globe in each, like a Ball in a Socket, and are ſo diſpoſed as if made to look directly backwards. They are perfectly ſmooth, and without thoſe Hemiſpherical Diviſions viſible in the Cornea of the Eyes of the Fly and Beetle kind, but appear more like thoſe of a Spider.

I have tried ſeveral ways of killing the *Animalcula* before mentioned, by mixing Salts, Spirits and Acids, *&c.* with their Water, the leaſt Touch of which will immediately deprive them of Motion and Life. But I never yet ſucceeded in any Trial of recovering or reviving them, after the Water was evaporated, by the addition of freſh Water; tho' ſome have affirmed they may be revived by that means, even an Hour after; nay, ſomebody in one of the *Tranſactions* ſays they will recover after the Water is boiled. Many of thoſe I have mentioned burſt when the Water dries; and tho' ſome keep their Shapes a little while, yet they too alter in a few Minutes, and I cannot imagine them recoverable.

—*Of* Microſcopes, *&c.* *by Mr.* Leuwenhoek. n. 273. p. 903.

5.] About three Years ago I was ſhew'd a Magnifying Glaſs, whoſe chiefeſt Excellency was, that one could ſee an Object a great diſtance from the ſaid Glaſs. As ſoon as ever I had put the Glaſs to my Eye, I concluded that there was a Hole or Cavity in it, by which the remote Object came to be ſeen: And when I came to view the Glaſs by one of my own which I had about me. I did not only diſcover one deep Pit or Cavity in it, but ſeveral other leſſer, which had not been ground out; ſo that upon the whole it ſeem'd a very inconſiderable Glaſs.

Laſt Winter came to me a Fellow, whoſe Buſineſs it is to grind Glaſſes, and bragged mightily of a Magnifying Glaſs that he had, whereby he could ſee into Metals and Minerals; I told him that the Pores of Metals were ſo cloſe and impervious, that it was impoſſible ever to ſee through them; and that Leaf-Gold, tho' never ſo thin beat, would teach us that. Hereupon he put his Glaſs into my Hands, adding, that I ſhould ſee the Light of the Candle through a Copper Circle which ſtood before the Magnifying Glaſs, and accordingly I ſaw a very imperfect Light through the Copper Circle. I told him that this was nothing; that he might cheat the Ignorant; but

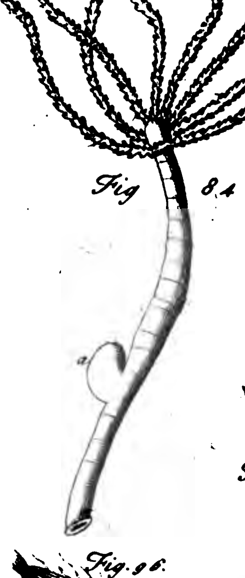


Fig 84

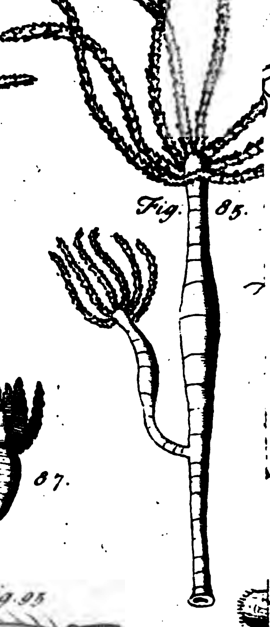


Fig. 85.

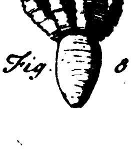


Fig. 87.

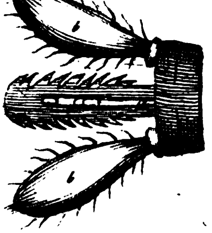


Fig. 96.

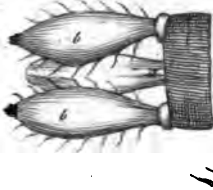


Fig. 95

91.

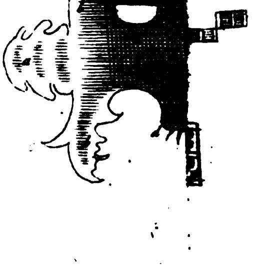


Fig. 94.

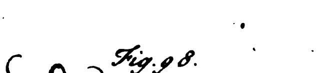


Fig. 97.

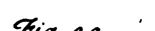


Fig. 98.

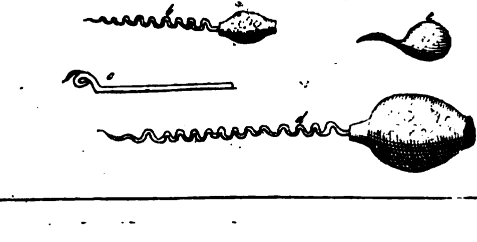


Fig. 99.

but that this *Phænomenon* was only occaſioned by a ſmall Part of the Glaſs that was not ground; and then I took an extraordinary Glaſs, which immediately diſcovered thoſe Parts that were not ground, and ſhewed him the ſame.

It has often happen'd, that in the burſting of Glaſs, or of Sparks flying out of Wood-coals (my Eye being a little too near) ſmall Particles of the Glaſs or Fire came into my Eye, and cauſed it to ſmart; upon which, I uſed to arm my Eyes with Spectacles againſt the like Accidents for the future.

Now I obſerve, when I look through one of my Glaſſes by Candle-light, that near the upper Part of my Eye, in the *Tunica Cornea*, there appears a fine ſmall Flame of a Candle inverſed, no bigger than the common Letters we uſe in writing, and oppoſite to it appear two round clear Lights, ſo very ſmall that the Flame of the Candle is not to be perceived therein.

From hence I conclude, that the *Tunica Cornea* of the Eye, by the Wound it received from thoſe Particles of Glaſs, has loſt ſomething of its Roundneſs, which occaſioned thoſe Appearances; and that when the wounded Part ſtood juſt before the Sight, it obſtructed it, &c.

I obſerved alſo, that in ſeveral Places of the *Tunica Cornea*, there lay Veins no longer than the breadth of two or three Hairs put together, wherein I could perceive the Globules of Blood very diſtinctly; theſe Veſſels were ſo ſmall, that they could contain but one Globule in the Diameter of them, and the Blood had no manner of Motion.

The Veſſels ſeem to me to be broken off from other Blood-Veſſels: and when the Particles of Blood are a little crouded together, or when one of thoſe longiſh Veſſels are ſomewhat bended, it appears to the Sight as if one ſaw a thick Cloud.

With this Cloud of ſmall Particles the Eyes are ſurrounded, but more one time than another; for ſome are diſperſed, and then others ariſe in their Places. When we view theſe Veſſels with their Globules of Blood, through one of my Glaſſes, againſt a Candle, or other ſtrong Light, they ſeem to be in a continual Motion, whereby thoſe Particles that are in the *Tunica Cornea*, be their Motion never ſo ſmall, ſeem to us as if they were moving in the Air; but by ſtrict Examination we ſhall find, that they are one and the ſame Particles, which ſometimes appear aſcending, and at other times deſcending.

Beſides the aforementioned Blood-Veſſels, we find in the *Tunica Cornea* round Particles that lie ſcattered about, which Particles I judge to be Globules of Blood. An ignorant Perſon ſeeing theſe Particles in continual Motion, (for ſometimes they appear aſcending, and ſometimes deſcending) would be apt to ſay, that theſe Particles were not in his Eye, but in the Air before the Glaſs; and perhaps too, that the deſcending Particles were the Influxes of the Stars, and thoſe that ſeemed aſcending, the Exhalations of the Earth, or other Bodies.

It has often befallen too, when I looked againſt a ſtrong Light thro' my Microſcopes, that I ſaw an infinite Number of exceeding ſmall Particles, that had all a glittering Motion.

I never imagined that theſe Particles were in the Air, as others would; but rather that they were in the Cryſtalline Humour of the Eye, between the *Tunica Cornea* and the *Cryſtallina*, the Motion of which ſmall Particles is occaſioned by preſſing the *Tunica Cornea* when we ſhut our Eye cloſe together.

Of the Regularity *in the* Births *of both* Sexes, *by Dr.* J. Arbuthnot. *n.* 328. *p.* 186.

VI. Among innumerable Footſteps of Divine Providence, to be found in the Works of Nature, there is a very remarkable one to be obſerved in the exact Balance that is maintained between the Numbers of Men and Women; for by this means it is provided, that the Species may never fail, nor periſh, ſince every Male may have its Female, and of a proportionable Age. This Equality of Males and Females is not the Effect of Chance, but Divine Providence, working for a good End, which I thus demonſtrate:

Let there be a Die of two Sides, M and F, (which denote Croſs and Pile:) Now to find all the Chances of any determinate Number of ſuch Dice, let the Binome M + F be raiſed to the Power, whoſe Exponent is the Number of Dice given; the Co-efficients of the Terms will ſhew all the Chances ſought. For example, in two Dice of two Sides $M+F$ the Chances are $M^2+2MF+F^2$. that is, one Chance for M double, one for F double, and two for M ſingle and F ſingle; in four ſuch Dice there are Chances $M^4+4M^3F+6M^2F^2+4MF^3+F^4$, that is, one Chance for M quadruple, one for F quadruple, four for triple M and ſingle F, four for ſingle M and triple F, and ſix for M double and F double; and univerſally, if the Number of Dice be *n*, all their Chances will be expreſſed in this Series.

$$M^n+\frac{n}{1}\times M^{n-1}F+\frac{n}{1}\times\frac{n-1}{2}\times M^{n-2}F^2+\frac{n}{1}\times\frac{n-1}{2}\times\frac{n-2}{3}\times M^{n-3}F^3+, \&c.$$

It appears plainly, that when the number of Dice is even, there are as many M's as F's in the middle Term of this Series, and in all the other Terms there are moſt M's or moſt F's.

If therefore a Man undertake with an even Number of Dice to throw as many M's as F's, he has all the Terms but the middle Term againſt him; and his Lot is to the Sum of all the Chances, as the Co-efficient of the middle Term is to the Power of 2 raiſed to an exponent equal to the Number of Dice: So in two Dice his Lot is $\frac{2}{4}$ or $\frac{1}{2}$; in three Dice, $\frac{6}{16}$ or $\frac{3}{8}$; in ſix Dice, $\frac{20}{64}$ or $\frac{5}{16}$; in eight, $\frac{70}{256}$ or $\frac{35}{128}$, &c.

To find this middle Term in any given Power or Number of Dice, continue the Series $\frac{n}{1}\times\frac{n-1}{2}\times\frac{n-2}{3}$, &c. till the Number of Terms are equal to $\frac{1}{2}$ n. For example, the Co-efficient of the middle Term of the tenth Power is $\frac{10}{1}\times\frac{9}{2}\times\frac{8}{3}\times\frac{7}{4}\times\frac{6}{5}=252$; the tenth Power of 2 is 1024: If therefore A undertakes to throw with ten Dice in one Throw an equal

Number of M's and F's, he has 252 Chances out of 1024 for him, that is, his Lot is $\frac{252}{1024}$ or $\frac{63}{256}$, which is leſs than $\frac{1}{4}$.

It will be eaſy by the Help of Logarithms, to extend this Calculation to a very great Number, but that is not my preſent Deſign. It is viſible from what has been ſaid, that with a very great Number of Dice, A's Lot would become very ſmall; and conſequently (ſuppoſing M to denote Male, and F Female) that in the vaſt Number of Mortals, there would be but a ſmall part of all the poſſible Chances, for its happening at any aſſignable time, that an equal Number of Males and Females ſhould be born.

It is indeed to be confeſſed that this Balance of Males and Females is not Mathematical but Phyſical, which alters much the foregoing Calculation; for in this Caſe the middle Terms will not exactly give A's Chances, but his Chances will take in ſome of the Terms next the middle one, and will lean to one ſide or the other; and it is not only highly improbable (if mere Chance govern'd) that they would never reach as far as the Extremities; but the Number of Times can be determined, in which it is an even Wager that the Males ſhall be born in any given Proportion to the Females. This Overbalance is wiſely prevented by the Oeconomy of Nature; and to judge of the Wiſdom of the Contrivance, we muſt obſerve that the external Accidents, to which Males are ſubject (who muſt ſeek their Food with Danger) do make a great havock of them, and that this Loſs exceeds far that of the other Sex, occaſioned by Diſeaſes incident to it, as experience convinces us. To repair that Loſs, provident Nature, by the Diſpoſal of its wiſe Creator, brings forth more Males than Females; and that in almoſt a conſtant Proportion. This appears from the annexed Tables, which contain Obſervations for 82 Years of the Births in *London*. Now, to reduce the whole to a Calculation, I propoſe this

Problem. A lays againſt B, that every Year there ſhall be born more Males than Females: To find A's Lot, or the Value of his Expectation,

It is evident from what has been ſaid, that A's Lot for each Year is leſs than $\frac{1}{2}$; (but that the Argument may be ſtronger) let his Lot be equal to $\frac{1}{2}$ for one Year. If he undertakes to do the ſame thing 82 times running, his Lot will be $\frac{1}{2}|^{82}$, which will be found eaſily by the Table of Logarithms to be $\frac{1}{4\ 8360\ 0000\ 0000\ 0000\ 0000\ 0000}$. But if A wager with B, not only that the Number of Males ſhall exceed that of Females, every Year, but that this Exceſs ſhall happen in a conſtant Proportion, and the Difference lie within fix'd Limits; and this not only for 82 Years, but for Ages of Ages, and not only at *London*, but all over the World; (which 'tis highly probable is Fact, and deſigned that every Male may have a Female of the ſame Country and ſuitable Age) then A's Chance will be near an infinitely ſmall Quantity, at leaſt leſs than any aſſignable Fraction. From whence it follows, that it is Art, not Chance, that governs.

There ſeems no more probable Cauſe to be aſſigned in Phyſics for this Equality of the Births, than that in our firſt Parents Seed there were at firſt form'd an equal Number of both Sexes.

Scholium. From hence it follows, that Polygamy is contrary to the Law of Nature and Juſtice, and to the Propagation of Human Race; for, where Males and Females are in equal Number, if one Man takes twenty Wives, nineteen Men muſt live in Celibacy, which is repugnant to the Deſign of Nature; nor is it probable, that twenty Women will be ſo well impregnated by one Man, as by twenty.

	Chriſtened.			Chriſtened.	
Anno	*Males.*	*Females.*	*Anno*	*Males.*	*Females.*
1629	5218	4683	1663	5411	4881
30	4858	4457	64	6041	5681
31	4422	4102	65	5114	4858
32	4994	4590	66	4678	4319
33	5158	4839	67	5616	5322
34	5035	4820	68	6073	5560
35	5106	4928	69	6506	5829
36	4917	4605	70	6278	5719
37	4703	4457	71	6449	6061
38	5359	4952	72	6443	6120
39	5366	4784	73	6073	5822
40	5518	5332	74	6113	5738
41	5470	5200	75	6058	5717
42	5460	4910	76	6552	5847
43	4793	4617	77	6423	6203
44	4107	3997	78	6568	6033
45	4047	3919	79	6247	6041
46	3768	3395	80	6548	6299
47	3796	3536	81	6822	6533
48	3363	3181	82	6909	6744
49	3079	2746	83	7577	7158
50	2890	2722	84	7575	7127
51	3231	2840	85	7484	7246
52	3220	2908	86	7575	7119
53	3196	2959	87	7737	7214
54	3441	3179	88	7487	7101
55	3655	3349	89	7604	7167
56	3668	3382	90	7909	7302
57	3396	3289	91	7662	7392
58	3157	3013	92	7602	7316
59	3209	2781	93	7676	7483
60	3724	3247	94	6985	6647
61	4748	4107	95	7263	6713
62	5216	4803	96	7632	7229

Chriſt-

	Chriſtened.			Chriſtened.	
Anno	*Males.*	*Females.*	*Anno*	*Males.*	*Females.*
1697	8062	7767	1704	6113	5738
1698	8426	7626	1705	8366	7779
1699	7911	7452	1706	7952	7417
1700	7578	7061	1707	8379	7687
1701	8102	7514	1708	8239	7723
1702	8031	7656	1709	7840	7380
1703	7765	7683	1710	7640	7288

Rules for Correcting *the Common* Computus *of* Intereſt, *&c. by Mr.* T. Watkins. n. 340. p. 111. *Of* Compound *Intereſt.*

VII. The Suppoſition whereon the Method of computing by Compound Intereſt is founded; *viz.* That all Intereſt Money, Rents, *&c.* are, or may be conſtantly received, and put out again at Intereſt, the Moment they become due, without any Charge, or Trouble, being impracticable; therefore all Computations by this Method (except of Fee-Simples or other Perpetuities) muſt needs be erroneous. Thus for inſtance, the Amount of a Sum of Money, or Annuity, for want of Deductions out of the Profits, for the unavoidable Trouble, Charge, and Delay in the Management, will be too great; and for the ſame reaſon, the preſent Value of a Sum of Money payable in any time to come, will be too little; alſo the preſent Value of an Annuity (being only the Amount of the difference between the Annuity, and Intereſt of the ſaid preſent Value) will be too much. But in long Terms of Years, as that difference becomes leſs, ſo does the Error, as the Term is greater; and in Fee-Simples it vaniſhes; the contrary to which happens in Amounts of Sums of Money, and Annuities.

All which is propoſed to be rectified, only by a juſt Reduction of the Rate, and Annuity; (which is done by deducting ſo much *per Cent.* thereout, as the whole Trouble, and Charge of Management is ſuppos'd to amount to, and reducing the Remainder, by a Diſcount equivalent to the ſuppoſed Loſs of Time) and then by working with the Rate ſo reduced, for Sums of Money, and with the Rate and Annuity reduced in the like Proportion for Annuities, according to the common Method of Compound Intereſt; as follows. Put r for the Rate of Intereſt of 1 *l.* c for the Charge and Trouble of the Management of 1 *l.* Then is $r - cr =$ the Rate after deducting the ſaid Charge, $=$ (putting d for $1 - c$) dr. And for the Diſcount put t for the time loſt, that is for ſuch part of the Period of time, in which the Payments are made (whether Yearly, Half Yearly, Quarterly, or otherwiſe) as is ſuppoſed to be ſpent in receiving and putting them out again at Intereſt. Then, dtr, being $=$ the Intereſt of 1 *l.* for that time; ſay, as $1 + dtr : 1 :: dr : \frac{dr}{1 \times dtr} =$ (putting e for $1 + dtr$) $\frac{dr}{e}$, which is equal to the reduced Rate, near enough for practice, for which put $\mathfrak{r}$. But if the utmoſt Accuracy be required, the Diſcount itſelf muſt be made with regard to the like Loſs of Time, which is done by a Series of Diſcounts raiſed thus; $e\ (=1+tdr) : tdr :: dr : \frac{td^2r^2}{e} :: \frac{td^2r^2}{e} : \frac{t^2d^3r^3}{e^2}$ &c. Whence $dr - \frac{td^2r^2}{e} + \frac{t^2d^3r^3}{e^2} - \frac{t^3d^4r^4}{e^3}$ &c. = (putting q for $\frac{tdr}{e}$) $\overline{1-q+q^2-q^3\text{ \&c.}}\times dr = \frac{dr}{e}\ (=\overline{1-q}\times dr) + \overline{q^2-q^3}$ &c. $\times\, dr$, is $=\mathfrak{r}$, = the true Rate reduced. Put $s=1+\mathfrak{r}$, n = the Time, p = the preſent Sum or Value, m = the Amount. Then will $\overline{1+\frac{dr}{e}+\overline{q^2-q^3}\text{ \&c.}\times dr}|^{n}\times p = \overline{1+\mathfrak{r}}|^{n}\times p = p\,s^n$, be exactly $=m$: But $\overline{1+\frac{dr}{e}}|^{n}\times p = m$ is ſufficient for Practice. And for the Amounts and preſent Values of Annuities;

Put A = Annuity *per annum*.
a = Annuity $\frac{1}{2}$ yearly, quarterly, &c.
R = Yearly Rate of Intereſt of 1 *l*.
r = Rate $\frac{1}{2}$ yearly, quarterly, &c.
$\mathfrak{r}$ = Reduc'd Rate yearly, $\frac{1}{2}$ yearly, quarterly, &c.
n = Number of Years, $\frac{1}{2}$ Years, Quarters, &c.

Then will $A\frac{\mathfrak{r}}{R} = a\frac{\mathfrak{r}}{r}$ be = reduced Annuity, taken yearly, half yearly, quarterly, or otherwiſe; and by Compound Intereſt 'twill be $\frac{\overline{1+\mathfrak{r}}|^{n}-1}{\mathfrak{r}}\times a\frac{\mathfrak{r}}{r} = \frac{\overline{1+\mathfrak{r}}|^{n}-1}{r}a = \frac{\overline{1+\mathfrak{r}}|^{n}-1}{R}A = \frac{s^n-1}{R}A = m$, and $\frac{s^n-1}{R\,s^n}A\ (=\frac{m}{s^n}) = p$. Whence the Theorems for ſolving all the other Caſes are eaſily deduced. And if the Rate be required, when 'tis for a Sum of Money, the Solution is obvious: when for the Amount or Value of an Annuity, ſince $\overline{1+r}|^{n} = \frac{mr+a}{a} = \frac{a}{a-pr}$ are the Equations, whence Theorems for the Rate are uſually derived, which by this Correction become $\overline{1+\mathfrak{r}}|^{n} = \frac{mr+a}{a} = \frac{a}{a-pr}$. That the ſame $\mathfrak{r}$ may be had on both ſides the Equation, put $u\mathfrak{r}$ for r, and 'twill be $\overline{1+\mathfrak{r}}|^{n} = \frac{mu\mathfrak{r}+a}{a} = \frac{a}{a-pu\mathfrak{r}}$; then, by the Rate aſſumed as near the Truth as may be, find the Value of u ($= \frac{1}{d} + tr = \frac{1}{d - td\mathfrak{r}}$) and in any Theorem for the Rate, putting $m\,u$ for m, and $p\,u$ for p, the Reſult will be the Rate reduced nearly: and by repeated Operations correcting $\mathfrak{r}$ and thereby u, the true $\mathfrak{r}$, and thence R the whole Rate, may be found.

The only difficulty that remains, is the right aſſuming the Quantities c and t, the Impoſſibility of doing which with perfect Exactneſs, I ſuppoſe to be the Reaſon why neither this, nor any Method of Correction to the like purpoſe, has yet been taken notice of by the Writers on this Subject; and what may therefore be very likely to be objected to this. But the ſame Objection I take to be of equal Force againſt the Eſtimates of any other Uncertainties whatſoever, as Eſtates for Lives, Inſurances, *&c.*

Firſt, then, for the Quantity c, which is put for the Trouble and Charge of Management, *viz.* of collecting and placing out the Money on good Security, together with all Contingences attending the ſame, as travelling Charges, Expences, Attorney's Bills, *&c.* of all which, the principal Article is the Charge of Collection or Receiver's Fees, which is commonly a fix'd Rate, cuſtomarily allow'd in the Place, or upon the Eſtate it ſelf, out of which the Purchaſe is made, if it be a Rent; and for Intereſt Money, or any other Annuity, the like Eſtimate is to be made, whether the Proprietor acts for himſelf, or by another. Then for the Charge of placing out the Money at Intereſt when receiv'd; though this be for the moſt part defray'd by the Borrower, yet becauſe it highly concerns the Lender to ſee it be ſecurely done, there are uſual Allowances made to Agents and Scriveners, to encourage their Care and Fidelity therein; beſides the Time, Expence and Trouble of the Proprietor himſelf, in finiſhing Contracts, inſpecting Securities, *&c.* and whatever is ſav'd in this Article, we muſt ſuppoſe to be fully made up by an Equivalent Degree of Riſque in the Security.

In the next place, for the loſs of time; though 'tis alſo impoſſible for this to be exactly aſcertain'd, nor perhaps ſo nearly as the former, ſince it depends very much on the Diligence of the Manager: Yet if the uſual times of Payment of the particular Rent or Annuity to be purchaſed, with a moderate degree of diligence in the Manager, and the uſual Indulgence practis'd by Men of Buſineſs in this Caſe towards one another be obſerv'd, a reaſonable Eſtimate may be alſo made of the loſs of time. In which 'tis to be noted, that Intereſt Money being uſually paid in ſmall Sums, when any Sum of Money to be made up of ſeveral ſuch Payments, is intended to be put out at Intereſt, the whole muſt lie dead, till the laſt Payment be made; alſo that the Principal lies dead ſometimes as well as the Intereſt: and that on the other hand, to ſave time, Borrowers may be found out, and treated with during the time of Collection; but this Advantage is in a great meaſure loſt by the difficulty

culty of fixing the Time or *Quantum* of a Loan, till the whole be paid in. Note alſo, that if the Charge of Collection, or Loſs of time, on the Rent, or Annuity, of any particular Eſtate or Place, be found to differ from that of the Intereſt of the Purchaſe Money, and ſo much exactneſs be required, as that the Computation be made with regard to ſuch difference: it muſt be done, either by aſſuming a proper Medium for both, or more accurately thus: For the reduc'd Rate of the $\left\{\begin{array}{l}\text{Annuity}\\ \text{Intereſt-Money}\end{array}\right\}$ put $\left\{\begin{array}{c}z\\ \mathfrak{r}\end{array}\right\}$ Then $r : z :: a : a\frac{z}{r}$, and $\mathfrak{r} : \overline{1+\mathfrak{r}}|^{n}$

$$-1 :: a\frac{z}{r} : \frac{\overline{1+\mathfrak{r}}|^{n}-1}{r}\, a \times \frac{z}{\mathfrak{r}} = m = \overline{1+\mathfrak{r}}|^{n} \times p.$$

To give a Specimen of this Method in Numbers, firſt the Quantities c and t are to be aſſum'd, which are not here to be accommodated to any particular Place or Eſtate, but to be taken in general: And firſt for c the Charge of Management; the uſual Rates of Collectors Fees in theſe Kingdoms, as I am inform'd, are 6*d.* 12*d.* and 18*d. per* Pound, but the moſt uſual 12*d.* which is 5 *per Cent.* However, to be within compaſs, I ſhall take 4 *per Cent.* for the Medium, including what further Trouble and Charge may attend the Receipt of the Money, beſides Receivers Fees; and 2 *per Cent.* for all the other Charges before mention'd, in placing it out at Intereſt, both which make 6 *per Cent.* ſo that c is $= 0{,}06$, and $d\ (= 1 - c) = 0{,}94$. Next for t the Loſs of Time; ſince few Annuities are paid yearly, and a Diſcount being given for the Loſs of Time, we are to loſe no more than is diſcounted for, therefore I chuſe Half-yearly Payments for the Examples, being the moſt uſual, which with little Alteration may ſerve for quarterly; and conſidering the before-mention'd Circumſtances relating to the Time, I look upon two Months the leaſt, and ſeven or eight Months the moſt, that can well be ſuppos'd to be ſpent, one time with another, in receiving and putting out the Money, upon a moderate Management; between which the Medium is about four Months and a half, which being $\frac{3}{4}$ of $\frac{1}{2}$ a Year, gives $\frac{3}{4} = t$: and if $\frac{dr}{e}$ be $= \mathfrak{r}$, the yearly Rates of 4, 5, 6, 8 and 10 *per Cent.* will produce for Half-yearly Rates reduc'd of 1 *l.* 0.018539, 0.023093, 0.027616, 0.036569 and 0.0454 each $= \mathfrak{r}$. But if $\mathfrak{r}$ be $= \frac{dr}{e}\overline{+q^2-q^3}$ &c. $\times\, dr$, 'twill be, 0.01854219, 0.0230999155, 0.027627775, 0.036596289 and 0.04545235, each $= \mathfrak{r}$, (ſo that each Rate loſes by this Eſtimate about $\frac{1}{11}$ Part.) Whence the following Amounts, and preſent Values of 1 *l. per Annum* computed Half-yearly, are produc'd and compar'd with thoſe of the uſual Method computed yearly, to agree with the common Tables.

Years.	*Amounts of* 1 l. per An. *at* 5 per Cent. *by*		*Differences.*	*Amounts of* 1 l. per An. *at* 6 per Cent. *by*		*Differences.*
	Comp. Int.	*Co. Int. cor.*		*Comp. Int.*	*Co. Int. cor.*	
5	5,52563	5,13104	,39459	5,63709	5,22138	,41571
10	12,57789	11,57846	,99943	13,18079	12,07854	1,10225
20	33,06595	29,85996	3,20599	36,78559	32,91054	3,87505
30	66,43885	58,72546	7,71339	79,05819	68,83976	10,21843
40	120,79977	104,30079	16,49898	154,76197	130,80733	23,95464
60	353,58372	289,88164	63,70208	533,12818	422,01429	111,11389
80	971,22882	752,53436	218,69446	1746, 5999	1288, 2484	458,3515
100	2610,02516	1905,92671	704,09845	5638, 3680	3864, 9753	1773,3927
	The ſame at 8 *per Cent.*			The ſame at 10 *per Cent.*		
5	5,86660	5,40633	,46027	6,10510	5,59705	,50805
10	14,48656	13,15092	1,33564	15,93743	14,32680	1,61063
20	45,76196	40,13759	5,62437	57,27500	49,17930	8,09570
30	113,28321	95,51623	17,76698	164,49402	133,96428	30,52974
40	259,05652	209,15737	49,89915	442,59257	340,21900	102,37357
60	1253,2133	920,90040	332, 3129	3034,81648	2062,57167	972,24481
80	5886,9354	3918,0576	1968, 8776	20474,0027	12255,3348	8218, 6679
100	27484,5157	16539,0989	10945,4168	137796,127	72575,3926	65220,7344

Years.	*Preſ. Values* of 1 l. per An. *at* 5 per Cent. *by*		*Differences.*	*Preſ. Values of* 1 l. per An. *at* 6 per Cent. *by*		*Differences.*
	Comp. Int.	*Co. Int. cor.*		*Comp. Int.*	*Co. Int. cor.*	
5	4,32948	4,08343	,24605	4,21236	3,97582	,23654
10	7,72174	7,33314	,38860	7,36009	7,00322	,35687
15	10,37966	9,91935	,46031	9,71225	9,30843	,40382
20	12,46221	11,97753	,48468	11,46992	11,06373	,40619
30	15,37245	14,91902	,45343	13,76483	13,41805	,34678
40	17,15909	16,78200	,37709	15,04630	14,78309	,26321
50	18,25593	17,96190	,29403	15,76186	15,57456	,18730
70	19,34268	19,18247	,16021	16,38454	16,29953	,08501
100	19,84791	19,79231	,05560	16,61755	16,59510	,02245
F.S.	20,00000	20,00000	,00000	16,66666	16,66666	,00000

Note, That this Correction is alſo applicable to the Valuations of Eſtates for Lives, in which the firſt Step being to find an Equivalent in Years of Continuance, brings them to the Caſe of Eſtates for Years.

Of Simple Intereſt.

The Abſurdity of the Suppoſition, on which the uſual Method of computing preſent Values by Simple-Intereſt, is founded, *viz.* That the Rent or Annuity is conſtantly received, and put out again at Intereſt, as it becomes due; but that the Intereſt of the Purchaſe Money lies dead during the whole Term, is ſo apparent, and the Errors ariſing from it ſo groſs, that the Writers who have laid down this Method, have at the ſame time caution'd againſt the Uſe of it for any more than 6 or 7 Years, the Error for that time being not conſiderable.

The ſame Suppoſition does alſo occaſion the Miſcomputation of Amounts, or rather the Miſapplication of them to their proper Caſes.

Wherefore, ſince the Simple-Intereſt of Money is of equal Value *pro rata*, and of the ſame regard with Rents or Annuities, being each the original Profits iſſuing alike from a principal Stock, Eſtate or Value, and equally improveable; This general Rule may ſerve for a juſt Correction of this Method, *viz.* That ſuppoſing in any Caſe an Intereſt ought to be, or not to be allowed to either of thoſe Profits, the ſame be done in the like Caſe to the other. Thus, in the Caſe of Debts, or Amounts of Sums of Money, Rents, or Annuities for the time paſt, it's uſual in practice to allow no Intereſt to either: For tho' the Law, to curb the exorbitant Avarice of Uſurers, and for other Reaſons, does more expreſly diſallow Intereſt upon Intereſt for a Debt; our Courts both of Law and Equity, as I am inform'd, will be as far from allowing the Charge of Intereſt againſt a Tenant for Rent in Arrear; except on a *nomine pœnæ* (which is now become almoſt obſolete) ſo that in this Caſe (putting a and r for the Annuity and Rate yearly, Half-yearly, or otherwiſe) as $prn+p$ is the Amount of a Sum of Money, ſo is an the Amount of an Annuity or Rent in Arrear, and not $\overline{\frac{n-1}{2}r+1}\times an$, as Arithmeticians commonly make it. But in the Computation of preſent Values, or Amounts for the time to come, the ſame being made on the Expectation of a conſtant regular Income of the Profits, without any extraordinary Interruption, an Intereſt ought to be allow'd to both, eſpecially in preſent Values, which are found by ſetting the Amounts of both againſt each other: ſo that in theſe Caſes, putting $x=n-1$, if $\overline{\frac{1}{2}xr+1}\times an$ be made the Amount of a Rent or Annuity; then $\overline{\frac{1}{2}xr+1}\times prn+p$, will be the proper Amount of a Sum of Money, and not $prn+p$: and conſequently $\frac{\overline{\frac{1}{2}xr+1}\times an}{\overline{\frac{1}{2}xr+1}\times rn+1}=p$ will be the preſent Value of a Rent or Annuity, the ſubſequent Intereſt being remitted on both ſides in lieu of the Loſs of Time and Charge of Management; which ſuch as are apt to depreciate long Futurities, may think the propereſt Method of approaching the true Value. But I rather look upon the former Method of Compound Intereſt corrected as more exact, as well as more general, the Intereſt remitted in this, being in ſhort terms leſs, and in long Terms more than an Equivalent for the Trouble, Charge and Delay in the Management. But it is however the moſt exact of any of the Methods, that have yet been deduc'd from Simple-Intereſt. The reduc'd Rate may alſo in ſome Caſes be properly made uſe of for Amounts, but not for preſent Values, except for ſhort Terms; and then, ſince $r:a::\overline{\frac{1}{2}x\mathfrak{r}+1}\times\mathfrak{r}n:\overline{\frac{1}{2}x\mathfrak{r}+1}\times an\frac{\mathfrak{r}}{r}$, 'twill be $\overline{\frac{1}{2}x\mathfrak{r}+1}\times an\frac{\mathfrak{r}}{r}=m=\frac{1}{2}x\mathfrak{r}\times1\times p\mathfrak{r}n+p$, and $\frac{\overline{\frac{1}{2}x\mathfrak{r}+1}\times an}{\overline{\frac{1}{2}x\mathfrak{r}+1}\times\mathfrak{r}n+1}\times\frac{\mathfrak{r}}{r}=p$.

Examples of this Method, compar'd with thoſe of the former, will ſtand as follows; in which all is computed Half-yearly, except the laſt Column of Compound Intereſt.

Amounts of 1 *l.* at 5 *per Cent.* computed 6 ſeveral Ways.

Years.	1	2	3	4	5	6
	Simple Int.	*Id. for Bonds*	*Sim. Int. cor.*	*Id. by the red. rate.*	*Comp. Int. cor.*	*Comp. Int.*
	$prn + p = m$	Id. till $prn = p$	$\overline{\tfrac{1}{2} \times r + 1} \times prn + p = m$	$\overline{\tfrac{1}{2} \times \mathfrak{r} + 1} \times p\mathfrak{r}n + p = m$	$\overline{1+\mathfrak{r}}\vert^{n} \times p = m$	$\overline{1+R}\vert^{N} \times p = m$
5	1,25	1,25	1,27813	1,25501	1,25655	1,27628
10	1,5	1,5	1,61875	1,56338	1,57892	1,62889
20	2,	2,	2,48750	2,34021	2,49300	2,65330
30	2,5	2,	3,60625	3,33048	3,93625	4,32194
40	3,	2,	4,97500	4,53419	6,21504	7,04000
60	4,	2,	8,46250	7,58194	15,49408	18,67919
80	5,	2,	12,95000	11,48345	38,62672	49,56144
100	6,	2,	18,43750	16,23874	96,29634	131,50126

Amounts of 1 l. *at* 6 per Cent. *by the ſame Theorems.*

5	1,3	1,3	1,3405	1,31063	1,31328	1,33822
10	1,6	1,6	1,7710	1,69758	1,72471	1,79084
20	2,2	2,	2,9020	2,70048	2,97463	3,20713
30	2,8	2,	4,3930	4,00870	5,13039	5,74349
40	3,4	2,	6,2440	5,62223	8,84844	10,28572
60	4,6	2,	11,0260	9,76525	26,32086	32,98769
80	5,8	2,	17,2480	15,12954	78,29488	105,79599
100	7,	2,	24,9100	21,71510	232,89852	339,30208

Amounts of 1 l. *at* 10 per Cent. *by the ſame Theorems.*

5	1,5	1,5	1,6125	1,54749	1,55970	1,61051
10	2,	2,	2,4750	2,30157	2,43268	2,59374
20	3,	2,	4,9500	4,42951	5,91793	6,72750
30	4,	2,	8,4250	7,38381	14,39643	17,44940
40	5,	2,	12,9000	11,16449	35,02190	45,25925
60	7,	2,	24,8500	21,20493	207,25717	304,48165
80	9,	2,	40,8000	34,55084	1225,5335	2048,4003
100	11,	2,	60,7500	51,20222	7258,5398	13780,6127

Years.	*Preſ. Values of* 1 l. per An. *at* 5 per Cent. *by*			*Preſ. Values of* 1 l. per An. *at* 6 per Cent. *by*		
	Sim.In.Cor.	*Co.Int. cor.*	*Comp. Int.*	*Sim.In.Cor.*	*Co.Int.cor.*	*Comp. Int.*
5	4,35208	4,08343	4,32948	4,23349	3,97582	4,21236
10	7,64478	7,33314	7,72174	7,25579	7,00322	7,36009
15	10,10821	9,91935	10,37966	9,39341	9,30843	9,71225
20	11,95980	11,97753	12,46221	10,92350	11,06373	11,46992
30	14,45407	14,91902	15,37245	12,87275	13,41805	13,76483
40	15,97990	16,78200	17,15909	13,99744	14,78309	15,04630
50	16,96682	17,96190	18,25593	14,69544	15,57456	15,76186
70	18,10986	19,18247	19,34268	15,47252	16,29953	16,38454
100	18,91525	19,79231	19,84791	15,99759	16,59510	16,61755
F.S.	20,00000	20,00000	20,00000	16,66666	16,66666	16,66666

The Theorems to the preceding Columns of Amounts (of which the fourth and fifth are infinitely variable in the Reſult, by aſſuming *c* and *t* in the reduc'd Rates at pleaſure) may ſerve to anſwer all ſimple Caſes of Amounts that occur in Buſineſs: To inſtance in ſome,

1. The firſt Column contains the Amounts of ſuch Debts, or Sums of Money, as carry a ſimple Intereſt till the Principal be paid.

2. The ſecond Column anſwers the common Caſe of Debts due by Bond, that by Law are allow'd not to exceed the Penalty, which is generally double the principal Debt.

3. The third Column anſwers the Caſe of a Security or joint Obligor, that has duly and conſtantly paid the Intereſt, and at laſt the principal Sum of a Debt, from which he has a Counter-Bond from the principal Debtor, to ſave him harmleſs, againſt whom he may make his Charge from this Column.

4. In caſe the Parties ſhall agree that the Debt ſhall lie for any time certain, or uncertain; and for the much greater eaſe, advantage and Satisfaction of both of them, no Intereſt to be call'd for, till the Principal it ſelf is paid; but to carry Intereſt as it becomes due, the Lender allowing for the Time and Charge he muſt have been at, in receiving and putting out his Intereſt, the fourth Column will fit this Caſe, or elſe the fifth as a greater or leſs Degree of Lenity is agreed upon in favour of the Borrower.

5. The fifth Column is alſo proper in the following Caſe, *viz.* if it be demanded what Eſtate in reverſion, after a certain number of Years, any Sum in Hand will purchaſe; the firſt ſtep being to find the Amount of that Sum to the Time the Reverſion commences, it's had in this Column.

6. The laſt Column gives the Amount of a Sum of Money, according to the common Method of Compound Intereſt, but being computed with that extraordinary rigor as has been ſaid, (except ſome ſmall Allowance for the Loſs of Time, by being done yearly) 'tis hardly ſuitable to any Caſe.

Other Caſes might be enumerated, to which the foregoing Theorems might be equitably apply'd; beſides ſuch extraordinary ones, wherein it may appear to Arbitrators, or a Court of Equity, that either Party deſerves Favour, either by way of Compenſation for Injuries ſuffer'd from the other, by means of any fraudulent or oppreſſive Practices, or otherwiſe, for which no other redreſs is provided.

Of Intereſt Accounts.

The Inequality of the uſual Method of ſtating *Intereſt Accounts*, as practis'd in our Courts of Equity, will beſt appear by an Example, for which I ſhall take the common general Caſe of an Intereſt-Account to be ſtated on a Mortgage, *viz.* ſuppoſe 1000 *l.* to be let out at 6 *per Cent.* on a Mortgage of 120 *l. per Annum*, payable Half-Yearly, and the Mortgagee after five Years end, to have Poſſeſſion till the Arrear of Intereſt, accruing Intereſt and Principal be diſcharged: *Quære*, How long that will be? ſuppoſing alſo, for the Sake of Brevity in the Account, the Payments to be equally, and punctually made as they become due. By the Chancery Method, the Rent is firſt apply'd to diſcharge the Arrear of Intereſt; and then the Remainder of every Half-Year's Rent, after deducting the ſame Half-Year's Intereſt, is apply'd towards the Diſcharge of the Principal, and thereby the Principal and Intereſt continually leſſens, till the whole be paid off. Now by this means the Mortgagee, after the Arrear is diſcharged, pays Compound Intereſt, with the utmoſt rigor, for ſo much *per Annum* of the Rent, as exceeds the Intereſt of the whole Principal Money, and receives but Simple-Intereſt for his Debt; which however ſtrange it may ſeem, is eaſily prov'd, by applying the proper Theorems of Simple and Compound-Intereſt to this Caſe, in which the Annuity, Principal Money, Rate and Arrear of Intereſt are given, and the Time requir'd; the Reſult being the ſame with that of the Chancery Method, except a very ſmall Difference only when any part of the Time is expreſs'd by a Fraction: *viz.* putting L for Logarithm, $\alpha = a - pr = 30$, $s = 1 + r = 1{,}03$, t = time of contracting the Arrear = 10 Half-years, n = any Number of Half-years ſpent in diſcharging the whole or any Part, N = Number of Years required; the Equation for the Arrear will be $prt + prn = an$; and for the Principal and accruing Intereſt $prn + p = prn + \frac{s^n - 1}{r} \times \alpha$. Whence $\frac{prt}{2\alpha} + \frac{La - L\alpha}{2Ls} = N = 16{,}7249$ Years = the time demanded; *i. e.* $\frac{prt}{2\alpha}$ = the time of diſcharging the Arrear, and $\frac{La - L\alpha}{2Ls} = 11{,}7249$ Years, = the time in which the Principal and accruing Intereſt is diſcharged; during which it's evident, the Mortgagee pays full Compound-Intereſt for 60 *l. per Annum* of the Rent. For the Correction of which Inequality, in the firſt place, to the end that neither Branch may exceed, or be depriv'd of its due Profits; this general

Rule is propos'd as neceſſary to be always obſerv'd, *viz.* that Amounts of the Produce on each Side be ſtated ſeparately, and ſet againſt each other in the Account, in order to a Balance. And in the common Caſes of Mortgages, Government, and Stock-Securities, *&c.* where the Debt is paid off by a Rent, Annuity, Penſion, Dividend, or other Payments iſſuing in the ſame manner, and with the like Trouble, Charge, *&c.* as Intereſt-Money does; I preſume this Rule will alſo be eaſily admitted, *viz.* that the ſame equitable Advantage be impartially allow'd on both Sides; for which the Method of Simple-Intereſt, as corrected under the foregoing Head, ſeems truly adapted; whereby the original Profits on each ſide are ſuppos'd to be deem'd, either as Intereſt, or elſe as principal Money. And ſince the Amounts both of an Annuity and Sum of Money, for the Time paſt, as they are ſtated, on the firſt of theſe Suppoſitions (t being there $=0$) are likewiſe vouch'd by our Laws, and the Practice of our Courts, to be good when ſeparately us'd; I think it's very evident, that the Account ought to be ſtated by ſetting thoſe Amounts againſt each other thus, $prt+prn+p=an$, (whence $\frac{1+tr}{2\alpha}p=N$, $=21,6666$ Years) and that this Method is moſt proper for general Uſe, in the Caſes mention'd: Unleſs it ſhould be thought fit, in Conſideration of the various Ways found out for the ready Improvement of Money, to allow a further Advantage on both ſides, by charging the Original Profits as Principal Money, and giving a Simple-Intereſt there too, which ſtill falls ſhort of the Advantage allow'd to Rents by the Chancery Method. And this is to be done two ways, *viz.* either by applying an Amount of Rent to pay off the Arrear firſt, and afterwards another Amount of Rent to diſcharge the Principal, and accruing Intereſt; or elſe by letting the Profits with all Arrears and other Charges run on at Simple-Intereſt on each ſide, till the End of the Term: *viz.* putting $x=n-1$, $y=t-1$, $\alpha=a-pr$, $f=\overline{2-r}\times\alpha$, $g=f-2ptr^2$, $\mu=\overline{\tfrac{1}{2}yr+1}\times prt=$ Arrear of Intereſt; by the firſt of theſe 'twill be, for the Arrear, $\mu+ptr^2n=\overline{\tfrac{1}{2}xr+1}\times\alpha n$, and for the Principal and accruing Intereſt, $\overline{\tfrac{1}{2}xr+1}\times\alpha n=p$; Whence $\frac{\sqrt{8\mu\alpha r+g^2}-\sqrt{8p\alpha r+f^2}-f+g}{4\alpha r}=N=18,7653$ Years. By the other 'twill be, for the whole, $\mu+ptr^2n+p=\overline{\tfrac{1}{2}xr+1}\times\alpha n$. Whence $\frac{\sqrt{\overline{\mu+p}\times 8\alpha r+g^2}-g}{4\alpha r}=N=18,1648$ Years. The Lender will have to alledge for the firſt of theſe two Ways, that as the Rent is not hindred by any other parallel

Charge from making the utmoſt Produce it can, ſo for that reaſon ought his Principal-Mony to have the Advantage of the Arrears being firſt diſcharged; which alſo agrees with the Chancery Method in this Particular.

Laſtly, another way of ſtating this Account, may be taken from that Notion of Simple-Intereſt, whereby the Annuity only is charged as Principal-Money: And then 'twill be, for the Arrear, $prt+prn=an$, and for the Principal and accruing Intereſt, $\overline{\tfrac{1}{2}xr+1}\times an=p$: Whence $\frac{\sqrt{8par+f^2}-g}{4ar}\left(=\frac{prt}{2a}+\frac{\sqrt{8par+f^2}-f}{4ar}\right.=N=$ 17,3072 Years; which appears to be the ſame with the Chancery-Method, only that the Compound-Intereſt in that, is turned into Simple in this; and as it ſtill retains part of the ſame Inequality, to the Advantage of the Borrower, it ſeems only fit to be obſerved in ſuch Caſes wherein the Borrower may be thought to merit Favour; as when the Debt is paid out of the Profits of Trade, ariſing by extraordinary Riſque or Induſtry. But ſince ſuch a Rule of Diſtinction is hardly poſſible to be reduced to general Practice, the uſe of this Theorem ſeems reſtrained to ſuch Caſes only, wherein the Parties themſelves, or a Court of Equity ſhall think it reaſonable.

For the further Illuſtration of theſe Rules, the following Specimen is added, which ſhews at ſight, how the Reſults of the ſeveral Methods differ, as the Rent, Arrear, or Rate of Intereſt, is greater or leſs; and conſequently of how much more or leſs Concern it is to the Parties, as well as to the due Adminiſtration of Juſtice, to have regard thereto.

I muſt alſo obſerve for the Sake of ſuch as are unacquainted with ſpecious Arithmetic, that though for brevity's ſake, the foregoing Theorems and Examples are laid down, and wrought in Algebraic Terms; yet the ſame Accounts may be ſtated after the Chancery-manner itſelf, according to the ſeveral Principles before deliver'd, that (inſtead of a continual Deduction of the Rent or Annuity out of the Principal and Intereſt of the Debt, which occaſions the Error before-mentioned) the preceding General Rule of ſtating ſeparate Amounts be obſerv'd, which may be done by continually adding the Profits together on each ſide, in the ſame manner, as if the Parties were to make a ſeparate Charge againſt each other; which is the rather to be noted, as being the only Courſe that can be taken, in caſe the Sums or Times of Payment ſhould differ, but the reſpective Reſults will notwithſtanding be analogous to the Examples.

The Time requir'd in	Years (computed Half-yearly)			
To diſcharge a Mort. of 1000 *l.* by a Rent of	120 *l. per annum.*		90 *l. per annum.*	
At the Rate of Int. *per annum* of	5 *per* C.	6 *per* C.	5 *per* C.	6 *per* C.
No Arrear of Intereſt.				
By the Chancery Method	10,9141	11,7249	16,4205	18,5835
By the ſame turning the Comp. Int. into Sim.				
By Simp. Int. cor. the Original Profits charged as Princ. and the Arrear contin^d at Int.	11,2579	12,3072	17,5335	20,7400
By Simp. Int. cor. the Original Profits charged as Princ. and the Arrear firſt diſcharg'd				
By Simp. Int. cor. the Original Profits charged as Intereſt	14,2857	16,6666	25,0000	33,3333
5 Years Arrear of Intereſt.				
By the Chancery Method	14,4853	16,7249	22,6705	28,5835
By the ſame turning the Comp. Int. into Sim.	14,8293	17,3072	23,7835	30,7400
By Simp. Int. cor. the Original Profits charged as Princ. and the Arrear contin^d at Int.	15,3191	18,1648	24,7148	32,7064
By Simp. Int. cor. the Original Profits charged as Princ. and the Arrear firſt diſcharg'd	15,5897	18,7653	25,4899	34,8052
By Simp. Int. cor. the Original Profits charged as Intereſt	17,8571	21,6666	31,2500	43,3333
10 Years Arrear of Intereſt.				
By the Chancery Method	18,0569	21,7249	28,9205	38,5835
By the ſame turning the Comp. Int. into Sim.	18,4007	22,3072	30,2335	40,7400
By Simp. Int. cor. the Original Profits charged as Princ. and the Arrear contin^d at Int.	20,3161	25,5998	33,6320	48,0874
By Simp. Int. cor. the Original Profits charged as Princ. and the Arrear firſt diſcharg'd	21,2895	27,5587	36,1932	53,8107
By Simp. Int. cor. the Original Profits charged as Intereſt	21,4286	26,6666	37,5000	53,3333
15 Years Arrear of Int.				
By the Chancery Method	21,6283	26,7249	35,1705	48,5835
By the ſame turning the Comp. Int. into Sim.	21,9721	27,3072	36,2835	50,7400
By Simp. Int. cor. the Original Profits charged as Princ. and the Arrear contin^d at Int.	26,1353	34,2913	43,9764	65,8386
By Simp. Int. cor. the Original Profits charged as Princ. and the Arrear firſt diſcharg'd	28,0209	37,7141	48,5159	74,5664
By Simp. Int. cor. the Original Profits charged as Intereſt.	25,0000	31,6666	43,7500	63,3333

All which is ſubmitted to the Conſideration of more diſcerning Judgments, eſpecially the Applications of the Rules to particular Caſes, for exemplifying the Theorems. But if any of thoſe Rules or Theorems ſhould be objected againſt, meerly becauſe they tend to introduce ſome Alterations in the preſent Practice; I ſhall for anſwer only add, that in former Ages, when our Laws relating to theſe Matters had their riſe, (the Profits of *England* ariſing chiefly from Huſbandry and Tillage, and little from Trade,) the Caſh of the Kingdom was but low, the Rates of Intereſt very high to the Advantage of Uſurers, and thoſe Ways for the ready Improvement of Money accommodated to all People's uſe, not known; (much like to which we are told was the State of the Jewiſh Affairs, when they were forbidden to take Uſury of any but Strangers.) But latter Ages have produc'd vaſt Alterations in all theſe Reſpects, which having happen'd by inſenſible Degrees, may be one Reaſon, why neither our Legiſlature, nor Courts of Judicature have yet taken ſuch Notice thereof, as Time and Leiſure, with the Tender of proper and practical Methods of Computation, may hereafter induce them to do.

VIII.

A Solution *of the* XV Problem *of Mr.* de Moivre, *in his Treatiſe of the* Value *of* Chances, *by Mr.* N. Bernoulli. n. 341. p. 133.

VIII. Whereas the ſynthetical Method, which Mr. *de Moivre* makes uſe of for finding the Chance of every Gameſter, cannot be apply'd to Practice when there are more Players than three, becauſe of the Law of the Progreſſion of theſe Series which offer themſelves, which is hardly to be perceived; I will here ſhew in what manner the Analyſis may be proſecuted, when the Stakes continually increaſe; for which end I ſhall give the analytical Demonſtration of three Theorems which I have found, and long before I ſaw Mr. *Moivre*'s Book de *Menſura Sortis*, on occaſion of three Queſtions propoſed to me by a Friend about that Game, which the *French* call *Jeu de la Poule*; that is, for finding the Probability of winning, the Gain or Loſs of each Player, and the Duration of the Game.

Theor. I. If any number of Gameſters A, B, C, D, E, *&c.* the Number of which is $n+1$, and their Skill equal, each lay down the Stake 1, and play upon theſe Conditions; firſt that two of them, A and B ſhall begin the Game. Secondly, that he that is beat ſhall yield his Place to the third C, ſo that this Third ſhall take up the Conqueror; and he that wins this Game ſhall play with the Fourth D, and ſo on. Thirdly, that he ſhall win all the Stakes who ſhall ſucceſſively beat all the Gameſters. I ſay that the Probability of winning of any two Gameſters that immediately follow one another in the Order of Play, is in the Ratio of $1+2^n$ to 2^n, and therefore that the Expectations of the Gameſters A, B, C, D, E, *&c.* are in Geometrical Progreſſion.

Demonſtration. Let the Expectations of winning of A or B be $=a$, of $C=c$, of $D=d$, of $E=e$, &c. Now as it may happen, that any of the Players entring the Game the firſt time may find an Adverſary, who has already been ſucceſſively Conqueror, either not at all, or once, or twice, or three times, *&c.* Let the Expectation of that Gameſter in the firſt caſe be $=z$, in the ſecond $=y$, in the third $=x$, in the fourth $=u$, in the fifth $=t$, *&c.* Alſo ſince any Gameſter may be beat by an Adverſary, who has before ſucceſſively conquer'd either none, or one, or two, or three, *&c.* of the Gameſters, ſo that going out of Play he may leave an Adverſary who has been Conqueror either once, or twice, or three times, *&c.* let the Expectation or Probability of winning of him who goes out, in the firſt caſe be equal to h, in the ſecond to k, in the third to l, in the fourth to m, *&c.* All theſe things being ſuppoſed, we ſhall have the nine following Series of Equations, mark'd N°. 1. N°. 2. N°. 3. *&c.* as far as N°. 9. *Tab.* 1. The Method of finding them in ſhort is this.

Among the Equations N°. 1. is found for Inſtance $f=\frac{1}{8}t+\frac{1}{8}u+\frac{1}{4}x+\frac{1}{2}y$. For the Player F will play either with the Gameſter A, or B, or C, or D, or E. Now that the firſt or ſecond may happen, it is neceſſary that either A or B may be Conqueror 4 times ſucceſſively, the Probability of which Event is $\frac{2}{16}$ or $\frac{1}{8}$. That the third may happen, it is neceſſary that C may be Conqueror three times, the Probability of which Event is alſo $\frac{1}{8}$. That the fourth may happen it is neceſſary that D may be Conqueror twice ſucceſſively, the Probability of which is $\frac{1}{4}$. That the fifth thing may happen it is neceſſary that E ſhould conquer once, the Probability of which Event is $\frac{1}{2}$. Therefore the Probability of winning of the Gameſter F is equal to $\frac{1}{8}t + \frac{1}{8}u + \frac{1}{4}x + \frac{1}{2}y$. Thus among the Equations N°. 2. it is for inſtance $x = \frac{1}{2}l + \overline{\frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \cdots \frac{1}{2^n}} \times b + \frac{1}{2^n} \times 1$. For he that plays with an Adverſary who has already been twice Conqueror, may beat either all the Gameſters, or ſome of them, or none. The Probability of the firſt Event is $\frac{1}{2^n}$, of the ſecond is $\frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \cdots \frac{1}{2^n}$, and of the third $\frac{1}{2}$. If the firſt Event happens, the Probability of winning is a compleat Certainty, or 1; if the ſecond, he goes out leaving a Gameſter who has beat once; if the third, he goes out leaving a Gameſter who has beat three times ſucceſſively, and therefore his whole Chance is $\frac{1}{2}l + \overline{\frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \cdots \frac{1}{2^n}} \times b + \frac{1}{2^n} \times 1$. By a like Reaſoning are found the Equations N°. 3. For the Gameſter who being beat by his Adverſary goes out of the Game, leaving for Example a Player who has won only one Game, acquires the Chance either of C, or of D, or of E, or of F, *&c.* according as the Adverſary by whom he is beat has conquer'd either all the Gameſters except one, or all except two, or all except three, *&c.* Whence it follows that $b = \frac{1}{2^{n-1}} \times c + \frac{1}{2^{n-2}} \times d + \frac{1}{2^{n-3}} \times e + \frac{1}{2^{n-4}} \times f$, *&c.* The Equations N°. 4. are found by ſubtracting the Equations N°. 2. from one another. And the Equations N°. 5. by ſubtracting the Equations N°. 3. from one another. The Equations N°. 6. are found by ſubſti-

turing

ſtituting the Values found by the Equations N°. 5. in the Equations N°. 4. The Equations N°. 7. are found by ſeeking the Values of z, y, x, u, *&c.* by the Equations N°. 1. And theſe Values being ſubſtituted in the Equations N°. 4. the Equations of N°. 8. will be had, which being compared with the Equations N°. 6. give the Equations of N°. 9. from whence it follows that $1+2^n \,.\, 2^n :: a \,.\, c :: c \,.\, d :: d \,.\, e$, *&c. Q. E. D.*

Corol. Hence the Probabilities of winning of all the Gameſters are eaſily found, which they have either before the Game begins, or in whatever State they can arrive in the Progreſs of the Game. For Example, if there are three Gameſters A, B, C, then will $n=2$, and $1+2^n \,.\, 2^n :: 5 \,.\, 4 :: a \,.\, c$. That is, the Probabilities of winning of A, B, C, before A beats B, or B beats A, will be as the Numbers 5, 5, 4, and therefore the Probabilities themſelves are as $\frac{5}{14}, \frac{5}{14}, \frac{4}{14}$. For all taken together ought to make 1, or perfect Certainty. After A has beat B, the Probabilities of winning of B, C, A, will be b, y, or c, and (becauſe A has an equal Expectation of the Victory, and to win B's Stake,) $\frac{1+b}{2}$ reſpectively; that is, becauſe by the firſt Equation N°. 3. 'tis $b = \frac{1}{2^{n-1}} \times c = \frac{1}{2}c$, and $c = \frac{4}{14} = \frac{2}{7}$ as is now found, their Probabilities will be $\frac{1}{7}, \frac{2}{7}, \frac{4}{7}$, as Mr. *de Moivre* has found, *Corol.* 1. *Prop.* 15. pag. 242.

If there are four Gameſters A, B, C, D, it will be $n=3$, and $1+2^n \,.\, 2^n :: 9 \,.\, 8$, and therefore the Probabilities of the Players at the beginning of the Game will be as $9, 9, 8, \frac{8 \times 8}{9}$, or as 81, 81, 72, 64; that is, a, b, c, d, will be $\frac{81}{298}, \frac{81}{298}, \frac{72}{298}, \frac{64}{298}$. After A has beat B, the Probabilities of B, D, C, A, will be $b, d, c, \frac{1+3b}{4}$. But it is by the firſt Equation, N°. 3. $b = \frac{1}{2^{n-1}} \times c + \frac{1}{2^{n-2}} \times d = \frac{1}{4}c + \frac{1}{2}d$. $c = \frac{72}{298} = \frac{36}{149}$, and $d = \frac{64}{298} = \frac{32}{149}$, as juſt now found. Therefore theſe Probabilities will be $\frac{25}{149}, \frac{32}{149}, \frac{36}{149}, \frac{56}{149}$ reſpectively. After A has beat B and C, the Probabilities of winning of C, B, D, A, will be k, $\frac{c}{2}$, x, $\frac{1+b}{2}$, or (becauſe by the ſecond Equation N°. 3. 'tis $k = \frac{1}{2^{n-2}} \times d = \frac{1}{2} d$, and by the third Equation N°. 7. 'tis $x = 2d - c$,) $\frac{16}{149}$, $\frac{18}{149}$, $\frac{28}{149}$, $\frac{87}{149}$. And it may be obſerved, that the Truth of the Calculation will be confirmed from hence, that the Sums of three Probabilities, that is, of $\frac{1}{7} + \frac{2}{7} + \frac{4}{7}$ in the firſt Example, and $\frac{25}{149} + \frac{32}{149} + \frac{36}{149} + \frac{56}{149}$, as alſo of $\frac{16}{149} + \frac{18}{149} + \frac{28}{149} + \frac{87}{149}$ in the laſt Example, are each equal to 1, or to perfect Certainty.

Theorem II. The ſame things being ſuppos'd as before, and this Condition being added, that he that is beaten ſhall always forfeit the Sum p, which ſhall increaſe the Stakes; that the Stakes ſo increaſed gradually ſhall belong to him who ſhall be Conqueror of all the Gameſters ſucceſſively; the Probabilities of winning of A (or B) C, D, E, *&c.* being ſtill denoted by the ſmall Letters a, c, d, e, *&c.* reſpectively, and their Expectations or Shares of the Stake which each expect by the reſpective great Letters A, C, D, E, *&c.* I ſay it will always be

$$C = \frac{\overline{A + ap} \times 2^n - ncp}{1 + 2^n}\ D = \frac{\overline{C + cp} \times 2^n - ndp.}{1 + 2^n}\ E = \frac{\overline{D + dp} \times 2^n - nep}{1 + 2^n}\ F, \&c.$$

Demonſtration. Let the Probability of winning of him that plays with his Adverſary be denoted as before by the ſmall Letters z, y, x, u, t, *&c.* who has already conquer'd ſucceſſively either none, or one, or two of the Gameſters. And by the ſame Capitals Z, Y, X, V, T, *&c.* his Expectation which he has in thoſe different Caſes, the Stakes being $n+1$, $n+1+p$, $n+1+2p$, $n+1+3p$, *&c.* reſpectively. Alſo thus by the ſmall Letters b, k, l, m, *&c.* let the Probability of winning be denoted, of the Gameſter beat by his Adverſary, who before had conquer'd either none, or one, or two, *&c.* of the Gameſters ſucceſſively; as alſo by the Capitals H, K, L, M, *&c.* let be denoted the Expectation of the ſame in thoſe different Caſes, the Stakes being $n+1+p$, $n+1+2p$, $n+1+3p$, *&c.* reſpectively. Theſe things being ſuppos'd, by the ſame way of reaſoning as before, the twelve following Series of Equations will be found mark'd in the ſecond Table N°. 1. N°. 2. N°. 3. *&c.* For Example among the

Equations N°.1. it is $E = \frac{V}{4} + \frac{X + xp}{4} + \frac{T + 2yp}{2}$. For the Gameſter E will play either with the Gameſter A, or with B, or C, or D. If he plays with A or B, his Expectation will be $=V$, becauſe he plays with an Adverſary who has already beat three Adverſaries, the Stakes being $n+1+3p$. If he plays with the Gameſter C, his Expectation will be $=X+xp$; for he plays with an Adverſary who has already beat two Gameſters, and therefore if the Stake were $n+1+2p$, his Expectation would be $=X$. But becauſe when E plays the Stake is $=n+1+3p$, becauſe of three Gameſters already beat, who forfeit the Sum p; to the Expectation X muſt be added that part of one Forfeiture p, which the Gameſter E may hope for. Now this part is $=xp$, becauſe the Probability of his winning is x, and therefore his whole Expectation will be $=X+xp$. Thus if he plays with the Gameſter D, his Expectation will be $=Y+2yp$. The Part $2yp$ is added to Y, which would be his Expectation, the Stakes being $n+1+p$, which part is due to him becauſe of the two Forfeitures $2p$, by which the Stakes $n+1+3p$ is greater than $n+1+p$. In a like manner will be had the Equations N°. 2, 3, 4, and 5. And by ſubſtituting the firſt Equation, N°. 2. *Tab.* I. in the Equations N°. 4. are had the Equations N°. 6. And by ſubſtituting the firſt Equation N°. 3. *Tab.* I. in the Equations N°. 5, are had the Equations N°. 7. which afterwards being ſubſtituted in the Equations N°. 6. are had the Equations N°. 8. The Equations N°. 9. are found by ſeeking the Values of Z, Y, X, V, *&c.* by the Equations N°. 1. *Tab.* I. and II. or N°. 2. *Tab.* II. and N°. 7. *Tab.* I. And theſe Equations being ſubſtituted in the Equations N°. 4. are had the Equations N°. 10. which being compared with the Equations N°. 8. (in which for z is ſubſtituted a, by Equat. 1. of *Tab.* I.) give the Equations N°. 11. And theſe Equations N°. 11. compared with the Equations N°. 9. T. 1. give the Equations N°. 12. which conſtitute the Theorem which was to be demonſtrated.

Corol. Hence alſo are eaſily found the Chances or Expectations of all the Gameſters, and thence their Gain or Loſs. For example, let there be three Gameſters A, B, C; 'tis $C = \frac{\overline{A + ap} \times 2^n - ncp}{1+2}$ $=$(becauſe $n=2$) $\frac{4A + 4ap - 2cp}{5} =$ (becauſe $a = \frac{5}{14}$, and $c = \frac{2}{7}$, by the *Corollory* of *Theor.* I.) $\frac{4A + \frac{6}{7}p}{5}$. Now ſince the Expectations of all the three taken together, that is A+A+C, ought to be equal to the whole Stake at firſt, that is to 3, it will be $2A + \frac{4A + \frac{6}{7}p}{5}$

$= \frac{14A + \frac{6}{7}p}{5} = 3$, and $14A = 15 - \frac{6}{7}p$, or $A = \frac{15}{14} - \frac{3}{49}p$, which is equal to the Expectation of either of the Gameſters A or B. Therefore the Expectation of the third Gameſter C is $C = \frac{4A + \frac{6}{7}p}{5} = \frac{6}{7} + \frac{6}{49}p$. From which Expectations if 1 is ſubtracted, which each ſtaked at the beginning, there will remain in the other $\frac{1}{14} - \frac{3}{49}p$, and here $\frac{6}{49}p - \frac{1}{7}$; as Mr. *De Moivre* has found.

Example 2. Let there be four Gameſters A, B, C, D. It will be $C = \frac{\overline{A + ap} \times 2^n - ncp}{1 + 2^n} = (\text{becauſe } n = 3)\ \frac{8A + 8ap - 3cp}{9} = (\text{becauſe } a = \frac{81}{298}, \text{ and } c = \frac{36}{149}$, by *Corol.* of *Theor.* 1.) $\frac{8A + \frac{216}{149}p}{9}$. Alſo $D = \frac{\overline{C + cp} \times 2^n - ndp}{1 + 2^n} = \frac{8C + 8cp - 3dp}{9} = (\text{becauſe } d = \frac{32}{149}$, by the ſame,) $\frac{8C + \frac{192}{149}p}{9} = \frac{64A + \frac{3456}{149}p}{81}$. Whence will be had the Equation $2A + C + D = 2A + \frac{8A + \frac{216}{149}p}{9} + \frac{64A + \frac{3456}{149}p}{9} = \frac{298A + \frac{5400}{149}p}{81} = 4$, or $149A + \frac{2700}{149}p = 162$, and $A = \frac{162}{149} - \frac{2700}{22201}p$. Hence $C = \frac{8A + \frac{216}{149}p}{9} = \frac{144}{149} + \frac{1176}{22201}p$, and $D = \frac{64A + \frac{3456}{149}p}{81} = \frac{128}{149} + \frac{4224}{22201}p$. Now ſubtracting Unity, which each ſtaked at the beginning of the Game, there will remain $\frac{13}{149} - \frac{2700}{22201}p$ for the Gameſter A or B, $\frac{1176}{22201}p - \frac{5}{149}$ for C, and $\frac{4224}{22201}p - \frac{21}{149}$ for D; each of which will ſhew the Gain or Loſs, according as the affirmative or negative part ſhall prevail. And by a like Method will be had all the Chances which they acquire in every State of the Game which they may arrive at.

Theorem III. The ſame things being ſuppoſed as before, if the Spectators Q, R, S, T, V, *&c.* are preſent, whoſe Number is n, that is, one leſs than the Number of Gameſters, the firſt of which Q affirms, that the Set will be over after $n+p$ Games are finiſh'd, R after $n+p-1$, S after $n+p-2$, T after $n+p-3$, V after $n+p-4$, *&c.* exactly and not before, and let q, r, s, t, u, *&c.* be the Chances of Q, R, S, T, V, *&c.* reſpectively. I ſay it will be $q = \frac{1}{2}r + \frac{1}{4}s + \frac{1}{8}t + \frac{1}{16}u +$ *&c.*

Demonſtration. Let that Gameſter be call'd A, who is ſuppos'd to win after $n+p$ Games. He is to come in after p Games, and then is to play with an Adverſary, who has already ſucceſſively beat either one, or two, or three, *&c.* of the Gameſters. Now that the firſt Caſe may happen, and that the Gameſter A may ſucceſſively beat all his Adverſaries but one, that is $n-1$ Adverſaries; ſince it is equally probable as that his Adverſary ſhould beat $n-1$ of the Gameſters, that is, (becauſe he has already beat one of his Adverſaries,) that the Set may conclude after $n+p-1$ Games are finiſh'd; and let the Probability of this Event be $=r$: The Probability that the Gameſter A may beat one Adverſary more, or that the Set ſhall end after $n+p$ Games, will be equal to $\frac{1}{2}r$. Thus that the ſecond Caſe may happen, and that A may beat all the Gameſters except two, is equally probable as that the Set ſhall end after $n+p-2$ Games, and therefore that then A ſhall beat ſtill two of the Gameſters, that is, that the Set ſhall end after $n+p$ Games, the Probability will be $= \frac{1}{4}s$. After the ſame manner in the third Caſe, that A may beat all the Gameſters, the Probability will be $= \frac{1}{8}t$; in the fourth $\frac{1}{16}u$; and ſo on. Wherefore indifferently that the Set may conclude after $n+p$ Games, the Probability is $\frac{1}{2}r + \frac{1}{4}s + \frac{1}{8}t + \frac{1}{16}u$, *&c.* $= q$. *Q. E. D.*

Corol. 1. It will be eaſy to find from hence what the Probability will be, that the Set ſhall finiſh in any given number of Games. For a Series of Fractions beginning from the Fraction $\frac{1}{2^{n-1}}$, whoſe Denominators increaſe in a continued duple Proportion, and the Numerator of each Fraction is the Sum of the Numerators of ſo many Fractions immediately foregoing as there are Units in $n-1$, will give all the Probabilities ſucceſſively that the Set ſhall end at n, $n+1$, $n+2$, $n+3$, *&c.* Games exactly. And conſequently if ſo many Terms of this Series are added together, as there are Units in $p+1$, their Sum will expreſs the Probability that the Set ſhall end at leaſt after $n+p$ Games are finiſh'd. For Example, if there are four Gameſters, and therefore $n=3$, we ſhall have this Series $\frac{1}{4}, \frac{1}{8}, \frac{2}{16}, \frac{3}{32}, \frac{5}{64}, \frac{8}{128}, \frac{13}{256}, \frac{21}{512}$, *&c.* from which if another is derived, $\frac{1}{4}, \frac{3}{8}, \frac{8}{16}, \frac{19}{32}, \frac{43}{64}, \frac{94}{128}, \frac{201}{256}$, *&c.* the Terms of which are the Sums of the Terms of the foregoing Series, the ſame Terms will denote the Probability, that the Set will finiſh at leaſt after 3, 4, 5, 6, *&c.* Games.

Corol. 2. Any Term of the former Series, except the firſt, as alſo the Sum of all the Terms, that is, any Term of the latter Series, may be thus expreſs'd in a general Form. If $n+1$ is the Number of Gameſters, and if p is the Number of Terms, the laſt Term of the former Series will be

$$\frac{1}{2^n} - \frac{p-n+1}{1\times 2^{2n}} + \frac{\overline{p-2n}\times\overline{p-2n+3}}{1\times 2\times 2^{3n}} - \frac{\overline{p-3n}\times\overline{p-3n+1}\times\overline{p-3n+5}}{1\times 2\times 3\times 2^{4n}} + \frac{\overline{p-4n}\times\overline{p-4n+1}\times\overline{p-4n+2}\times\overline{p-4n+7}}{1\times 2\times 3\times 4\times 2^{5n}}, \text{ \&c.}$$

And the Sum of all the Terms, or the laſt Term of the latter Series will be

$$\frac{p+1}{1\times 2^{p}} + \frac{\overline{p-n}\times\overline{p-2n+3}}{1\times 2\times 2^{2n}} + \frac{\overline{p-2n}\times\overline{p-2n+1}\times\overline{p-2n+5}}{1\times 2\times 3\times 2^{3n}} - \frac{\overline{p-3n}\times\overline{p-3n+1}\times\overline{p-3n+2}\times\overline{p-3n+7}}{1\times 2\times 3\times 4\times 2^{4n}}, \text{ \&c.}$$

Corol. III. Any one may undertake, before the Game begins, to pay the Sum $n+1$, for which the Gameſters play, and all the Forfeitures, if at firſt there is given into his Hand the Sum $n + 1 + 2^n - 1 \times p$.

I ſhall leave the Demonſtration of the two foregoing Corollaries to be found by the Curious in theſe Matters.

TABLE I.

Comes in		Goes out	
	Chance		Chance
0	z	1	b
1	y	2	k
2	x	3	l
3	u	4	m
4	t		

N°. 1.

$$a = z$$

$$c = y$$

$$d = \frac{1}{2}x + \frac{1}{2}y$$

$$e = \frac{1}{4}u + \frac{1}{4}x + \frac{1}{2}y$$

$$f = \frac{1}{8}t + \frac{1}{8}u + \frac{1}{4}x + \frac{1}{2}y$$

N°. 2.

$$z = \frac{1}{2} + \overline{\frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \cdots \frac{1}{2^n}} \times b + \frac{1}{2^n} \times 1$$

$$y = \frac{1}{2}k + \overline{\frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \cdots \frac{1}{2^n}} \times b + \frac{1}{2^n} \times 1$$

$$x = \frac{1}{2}l + \overline{\frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \cdots \frac{1}{2^n}} \times b + \frac{1}{2^n} \times 1$$

$$u = \frac{1}{2}m + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \cdots \frac{1}{2^n} \times b + \frac{1}{2^n} \times 1$$

N°. 3.

$$b = \frac{1}{2^{n-1}} \times c + \frac{1}{2^{n-2}} \times d \frac{1}{2^{n-3}} \times e + \frac{1}{2^{n-4}} \times f + \cdots$$

$$k = \frac{1}{2^{n-2}} \times d + \frac{1}{2^{n-3}} \times e + \frac{1}{2^{n-4}} \times f + \cdots$$

$$l = \frac{1}{2^{n-3}} \times e + \frac{1}{2^{n-4}} \times f + \cdots$$

$$m = \frac{1}{2^{n-4}} \times f + \cdots$$

N°. 4. N°. 6. N°. 8.

$$\begin{aligned} z-y &= \frac{1}{2}b-\frac{1}{2}k = \frac{1}{2^n}\times c = a-c \\ y-x &= \frac{1}{2}k-\frac{1}{2}l = \frac{1}{2^{n-1}}\times d = 2c-2d \\ x-u &= \frac{1}{2}l-\frac{1}{2}m = \frac{1}{2^{n-2}}\times e = 4d-4e \end{aligned}$$

N°. 5.

$$\begin{aligned} b-k &= \frac{1}{2^{n-1}}\times c \\ k-l &= \frac{1}{2^{n-2}}\times d \\ l-m &= \frac{1}{2^{n-3}}\times e \end{aligned}$$

N°. 7.

$$\begin{aligned} z &= a \\ y &= c \\ x &= 2d-y = 2d-c \\ u &= 4e-x-2y = 4e-2d-e \end{aligned}$$

N°. 9.

$$\begin{aligned} c &= a\times\frac{2^n}{1+2^n} \\ d &= c\times\frac{2^n}{1+2^n} \\ e &= d\times\frac{2^n}{1+2^n} \end{aligned}$$

Of a New Paſſage *of the* Drink *and* Urine; *by Monſ.* Morin. *Communicated by Monſ.* Blondel. n. 278. p. 1101.

IX. Monſieur *Morin* (in the Aſſembly of the *Academy* of *Sciences*) having obſerved the extreme Swiftneſs with which the Drink paſſes ſometimes, as they find that drink *medicinal* Waters, thence conjectured that it did not always go the way which *Anatomy* ſhews us it takes ordinarily; and that therefore it ought to have another ſhorter Paſſage, which is not yet diſcovered. A ſtrong Proof of this his Conjecture is, that thoſe who purge with an Infuſion of *Caſſia*, render in a very ſhort time by Urine, a Tincture as black almoſt as the Infuſion they have taken; which would not conſtantly happen, if the Drink took always the ordinary Way. In order to diſcover this unknown Paſſage for the Urine, he began with the Explication of the Uſe of the Drink, which is to help the Digeſtion, and to ſerve for a *Vehicle* to the *Chyle*: He ſaid, that the *Urine* is nothing elſe but the Drink itſelf, which having ſerved for this Purpoſe, is afterwards caſt out more or leſs loaded; that thoſe who drink much without eating, as when they take the Waters, render their Urine very ſuddenly, and that without Colour. On the contrary, they that drink little and eat much, render theirs ſlower and high coloured; and laſtly, they who both eat and drink very much, render theirs at firſt one Part leſs coloured, and afterwards another Part high coloured later.

Plat. 29
& Cart

Plate XIII Vol. V. Part II. Page 264.

Exit TABULA. II.

N° 1

ors	Depositum		Sors	Deposit.	
Z	$n+1+p$		H	$n+1+$	$A=Z$
Y	$n+1+2p$		K	$n+1+p$	$C=Y$
X	$n+1+3p$		L	$n+1+2p$	$D=\frac{1}{2}X+\frac{1}{2}\times\overline{Y+yp}$
V	$n+1+4p$		M	$n+1+3p$	$E=\frac{1}{4}V+\frac{1}{4}\times\overline{X+xp}+\frac{1}{2}\times\overline{Y+2yp}$
T				$n+1+4p$	$F=\frac{1}{8}T+\frac{1}{8}\times\overline{V+vp}+\frac{1}{4}\times\overline{X+2xp}+\frac{1}{2}+\overline{Y+3yp}$

N° 2

$hp+\frac{1}{8}\times\overline{H-p+2hp}+\frac{1}{16}\times\overline{H-p+3hp}+\text{——}\frac{1}{2^n}\times\overline{H-p+nhp-hp}+\frac{1}{2^n}\times\overline{np+n+1}$

$hp+\frac{1}{8}\times\overline{H-p+3hp}+\frac{1}{16}\times\overline{H-p+4hp}+\text{——}\frac{1}{2^n}\times\overline{H-p+nhp}\ +\frac{1}{2^n}\times\overline{np+p+n+1}$

$hp+\frac{1}{8}\times\overline{H-p+4hp}+\frac{1}{16}\times\overline{H-p+5hp}+\text{——}\frac{1}{2^n}\times\overline{H-p+nhp+hp}+\frac{1}{2^n}\times\overline{np+2p+n+1}$

$hp+\frac{1}{8}\times\overline{H-p+5hp}+\frac{1}{16}\times\overline{H-p+6hp}+\text{——}\frac{1}{2^n}\times\overline{H-p+nhp+hp}+\frac{1}{2^n}\times\overline{np+3p+n+1}$

N° 3

$+\frac{1}{2^{n-2}}\times\overline{D+ndp-2dp}+\frac{1}{2^{n-3}}\times\overline{E+nep-3ep}+\frac{1}{2^{n-4}}\overline{F+nfp-4fp}+\text{——}$

$+\frac{1}{2^{n-3}}\times\overline{E+nep-2ep}+\frac{1}{2^{n-4}}\times\overline{F+nfp-3fp}+\text{——}$

$+\frac{1}{2^{n-4}}\times\overline{F+nfp-2fp}+\text{——}$

$+\text{——}$

N° 6 — N° 8

$+\frac{1}{8}hp+\frac{1}{16}hp+\text{——}\frac{1}{2^n}\times hp=\frac{1}{2}K-\frac{1}{2}H+2p-\frac{1}{2}hp=-\frac{1}{2^{n-0}}\times C-\frac{ncp}{2^n}+2p$

$+\frac{1}{8}hp+\frac{1}{16}hp+\text{——}\frac{1}{2^n}\times hp=\frac{1}{2}L-\frac{1}{2}K+2p-\frac{1}{2}hp=-\frac{1}{2^{n-1}}\times D-\frac{ndp}{2^{n-1}}-\frac{cp}{2^n}+2p$

$+\frac{1}{8}hp+\frac{1}{16}hp+\text{——}\frac{1}{2^n}\times hp=\frac{1}{2}M-\frac{1}{2}L+2p-\frac{1}{2}hp=-\frac{1}{2^{n-2}}\times E-\frac{nep}{2^{n-2}}-\frac{dp}{2^{n-1}}-\frac{cp}{2^n}+$

N° 7

$-cp+\frac{1}{2^{n-2}}\times dp+\frac{1}{2^{n-3}}\times ep+\frac{1}{2^{n-4}}fp+\text{——}=-\frac{1}{2^{n-1}}\times C-\frac{ncp}{2^{n-1}}+hp$

$-dp+\frac{1}{2^{n-3}}\times ep+\frac{1}{2^{n-4}}\times fp+\text{——————}=-\frac{1}{2^{n-2}}\times D-\frac{ndp}{2^{n-2}}-\frac{cp}{2^{n-1}}+hp$

$-ep+\frac{1}{2^{n-4}}\times fp+\text{——————}=-\frac{1}{2^{n-3}}\times E-\frac{nep}{2^{n-3}}-\frac{dp}{2^{n-2}}-\frac{cp}{2^{n-1}}+hp$

N° 10 — N° 8

$C-A=Y-Z=-\frac{1}{2^n}\times C-\frac{ncp}{n}+2p$

$2D-2C-cp=X-Y=-\frac{1}{2^{n-1}}\times D-\frac{ndp}{2^{n-1}}-\frac{cp}{2^n}+2p$

$2cp$ $4E-4D-2dp-cp=V-X=-\frac{1}{2^{n-2}}\times E-\frac{nep}{2^{n-2}}-\frac{}{2^{n-1}}-\frac{cp}{2^n}+2p$

N° 12

$-ncp=\frac{\overline{A+ap}\times 2^n-ncp}{1+2^n}$

$-\frac{1}{2}+ap\times 2^{n-1}-ndp=\frac{\overline{C+cp}\times 2^n-ndp}{1+2^n}$

$\frac{-\frac{1}{2}+cp\times 2^{n-2}-\frac{1}{4}+ap\times 2^{n-2}-nep}{1+2}=\frac{\overline{D+dp}\times 2^n-nep}{1+2^n}$

From whence, and from what he had before ſaid, he inferr'd, that the Drink, beſides the ordinary Paſſage which it has to the Bladder by the *Emulgent* Veins, *Kidneys*, and *Ureters*, has likewiſe another by the Pores of the *Stomach*, and of the *Bladder*. He called thoſe the firſt *Urines*, which paſs by this new Way, and the ſecond *Urines*, thoſe that paſs the ordinary way. He afterwards proved the Poſſibility of this new *Syſtem* by Experiments. He ſaid, that having taken the *Ventricle* and *Bladder* out of a dead Body, and filled them with Water, it run all out through the Pores; and turning them inſide outwards, the Water that was put in them, run through after the ſame manner; and that laſtly, letting them ſwim in Water, it eaſily ſoaked through into them. From which he concludes, that in a living Body, it ought to paſs with much greater Facility by the *Tenſion* of the Stomach; for the *Aliment*, like a Sponge, ſoaks up the *Liquor* in which it ſwims, and ſo ſwells up the *Stomach*, which in its turn again preſſing the Food, ſqueezes out the Liquor from it, and forces it to filter through its Pores. With this Preſſion it is eaſy to conceive, that the Drink muſt paſs eaſier through the Pores of the *Stomach* than the Water, which was put into the *Stomach*, taken out of the dead Body; and that this *Liquor* re-entering into the *Bladder*, makes the firſt *Urine*: It is evident likewiſe, that this Preſſion is never ſtrong enough to preſs out all the *Liquor* from the *Stomach*, and ſo there remains enough to carry on the *Aliment* and *Chyle*; after which it comes away high loaded and coloured, and makes what he calls the ſecond *Urines*. He added, that the Paſſage of the Drink into the Capacity of the lower Belly did not cauſe the *Dropſy*, becauſe that Liquor aided by the Preſſure of the Parts that encompaſs it, finds an eaſy Entrance into the *Bladder*, and none into the *Inteſtines*, becauſe of the thick *Mucus* that lines them: The Eaſineſs of this Paſſage is the Cauſe that *Mineral* Waters run away ſo ſuddenly by the firſt Ways, and by the ſecond; but much more by the firſt, when there is but little Nouriſhment in the Stomach; for there runs more or leſs Urine by the firſt Ways than by the ſecond, in proportion to the *Aliment* taken, and to the *Surplus* of what is neceſſary for the Digeſtion, reſpect being had likewiſe to what paſſes inſenſibly by Tranſpiration.

This *Syſtem* being ſo laid down, he gave the Reaſons of two conſiderable *Phænomena*.

The firſt was, the different Colour of the Urine that is made at different Times; which proceeded from hence, that thoſe that paſs by the firſt Ways are but little charged, whereas the other that paſs by the ſecond Ways, having ſerved for a Vehicle to the Chyle, and circulated with the Maſs of Blood, are charged with the volatile and ſulphureous Parts, and other Excrements of the Blood, and conſtantly more coloured.

The ſecond *Phænomenon* was the Red, Greeniſh, and ſometimes Blackiſh Colour of the Urine of thoſe that are purged with the Infuſion of *Caſſia.* This, according to him, is, becauſe the Tincture paſſes by the firſt Ways, as was experimented in the Stomach of a dead Man, where this Liquor paſſes indeed more ſlowly, and in a leſs Quantity, but always of a greeniſh Red. It is the ſame of the Red Tincture of the Urine after eating Beets; of the Violet Brown, which is obſerved after drinking of Mineral Waters; of the Smell of *Violets* after taking Pills of Turpentine, and of the ſtrong Smell after *Aſparagus*: all which comes from the firſt Urines, being charged with that Colour and Smell, which is not taken away by any thing that is mixed with it; whereas the ſecond Urine, which carries the Chyle and Aliment, has no other Colour or Smell than Urine ordinarily has. Monſieur *Marin* did not give this Syſtem as New, but as explained more exactly, and in ſome meaſure demonſtrated by the Experiments he reported.

Two Anatomical *Obſervations; by Mr.* W. Cheſelden, n. 337. p.

X. I have met with an *Ureter* double of two Thirds of its Length next the Kidneys, and diſtended by Stones paſſing thro' it.

And the *Tubæ Fallopianæ* impermeable, and without *Alæ Veſpertilionis*; the outer Ends being connected to the *Teſtes.*

XI. *Papers Omitted.*

n.329. p.213 1. De *Menſura Sortis*, ſeu de Probabilitate eventuum in Ludis a Caſu fortuito pendentibus, Autore *Abr. du Moivre*, R. S. S.

n.341. p.145 2. Solutio Generalis *Problematis* XV. (in Tractatu de *Menſura Sortis*) ope *Combinationum* & *Serierum Infinitarum*, per D. *Abr. du Moivre*, R. S. S.

n.307. p.1282 3. An Account of what *Manuſcripts* were left by Mr. *John Ray*; by Mr. *Samuel Dale.*

n.273. p.898
n.276. p.1041 4. An Advertiſement of *Books* printed, and Reprinting in *Italy.*

XII. *Papers of Mr.* Leuwenhoek's *Omitted.*

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n.270. p.821 3. On the Spawn of Codfiſh, &c.

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n.292. p.1614 11. Of Cochineel.

12. Of the Fleſh of Whales; of the Cryſtalline Humour of the Eye of Whales, Fiſh, and other Creatures.	n.293. p.1723
13. Of the Tubes that convey the yellow Sap in *Chelidonium majus.*	*Ibid.* p.1730
14. Of Tobacco Aſhes.	*Ibid.* p. 1740
15. Of ſome Foſſils of *Switzerland.*	n.294. p.1774
16. Of *Animalcula* on the Roots of Duckweed, *&c.*	n.295.p.1784
17. Obſervations on ſtaining the Fingers with a Solution of Silver in *Aqua Fortis.*	*Ibid.* p. 1794
18. On the Barks of Trees.	n.296. p.1843
19. On the vitrified Salts of calcined Hay.	*Ibid.* p. 1856
20. On the Seed-Veſſels, and Seeds of *Polypodium.*	n.297. p.1868
21. Of the Figures of the Salts of Cryſtal.	n.298. p.1906
22. Of the Pumice Stone, Corals, Sponges, *&c.*	n.304. p.2158
23. On the Seeds of ſeveral *Eaſt-India* Plants.	n.305. p.2205
24. Of the Structure of the Spleen; and the Proboſcis of a Flea.	n.307. p.2305
25. Of the Salts of Pearls, Oyſter-Shells, *&c.*	n.311. p.2416
26. On the Particles of Silver diſſolved in *Aqua fortis.*	*Ibid.* p. 2425
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28. Of the Whiteneſs of the Tongue in Fevers.	*Ibid.* p. 2456
29. On the Blood-Veſſels, and Membranes of the Inteſtines.	n.314. p.53
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39. Of the *Animalcula in Semine* of young Rams.	n.331. p.316
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43. Farther Obſervations on the *Animalcula* found upon Duckweed.	n.337. p.160

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1. *Apicii Cælii* de Opſoniis, & Condimentis, ſive de Arte Coquinaria Libri Decem; cum Annotationibus *Martini Liſter*, & variis Lectionibus integris *Humelbergii Barthii*, & Variorum. *Lond.* 1705, 8vo.	n.294. p.1782
2. ΝΕΚΡΟΚΗΔΕΙΑ, or the *Art* of *Embalming*, wherein is ſhewn the Rites of Burial, and Funeral Ceremonies, eſpecially that of Preſerving Bodies after the *Egyptian* Method. Together with an Account of	n.302. p.1011

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A

A GENERAL

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